RAILROAD GAZETTE

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RAILROAD GAZETTE DIRECTORY: CLASSIFIED ADVERTISEMENTS.

RAILROAD GAZETTE DIRECTORY CLASSIFIED ADVERTISEMENTS.

Locomotives (Continued)
Pittsburgh Loco.& Car W'ks,Pittsburgh.
H. K. Porter & Co., Pittsburgh, Pa.
Richmond (Va.) Loco. & Mach. Works.
Rogers Loc. & Mch.Wks., Paterson, N. J.
Schenectady (N. Y.) Loco. Works.
Taite & Carlton, London, Eng.
Wharton R. R. Switch Co., Phila.

Locomotive Finishing Varnish
Flood & Conklin, Newark, N. J.

Locomotive Headlights
Adams & Westlake Co., Chicago.
Nat. Elect. Headlight Co., Indianapolis.

Locomotives, Second-Hand
Reginald Canning & Co., 115 B'way,N.Y.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.

Locomotive Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.

Lubricators
American Supply Co., Kansas City, Mo.
Nathan Mfg. Co., 92 Liberty street, N. Y.

Machinists' Tools
Acme Machy. Co., Cleveland, O.
Bement, Miles & Co., Philadelphia, Pa.
Billings & Spencer Co., Hartford, Conn.
E. W. Bliss Co., Brooklyn, N. Y.
Brown & Sharpe Mfg. Co., Providence,
Ferracute Machine Co., Bridgeton, N. J.
Gould & Eberhardt, Newark, N. J.
Edw. Harrington, Son & Co., Phila.
Hayes Tool Co., Portland, Me.
Long & Allstatter Co., Hamilton, O.
Manning, Max. & Moore, 111 Liberty St.,
Morse Tw.Dr.& Mach.Co.,N.Bed'd, Mass.
Newark Mach. Tool Wks., Newark,N. J.
Niles Tools Works, Hamilton, O.
Pedrick & Ayer, Philadelphia, Pa.
Geo. Place, 120 Broadway, N. Y.
D. Saunders' Sons, Yonkers, N. Y.
Wm. Sellers & Co., Philadelphia.
Stiles & Parker Press Co., Middletown, Conn.
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.
Universal Radial Drill Co., Cincinnati.
Watson & Stillman, 240 E. 43d St., N. Y.
Wharton R. R. Switch Co., Phila.

Malleable Iron Castings.
National Malleable Castings Co., Cleveland.

Mandrel Rolled Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.

Mining Machinery
Lidgerwood Mfg.Co., 96 Liberty St., N.Y.
Union Iron Works, San Francisco.

Mop Wringer
Boston Wringer Co., Boston.

Nut Locks
Amer. Washer & Mfg. Co., Newark, N. J.
Metcalf, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark.
Ruffner & Dunn, Philadelphia, Pa.
Standard Nut Lock Co., N. Y.

Oil Cans
Adams & Westlake Co., Chicago.
Bryant & Barbey, 79 Milk St., Boston.
H. A. Williams Mfg. Co., Boston.

Oil
Signal Oil Works, Ltd., Franklin, Pa.

Ore Handling Machinery.
King Iron Bridge Mfg. Co., Cleveland,O.

Packing, Asbestos
H. W. Johns Mfg.Co., N. Y. City.

Packing-Rubber
N. Y. Belting & Pack. Co., N. Y. City.

Paint
Andress Paint & Color Co., 15 Cortlandt street, N. Y.
F. W. Devoe & Co., Fulton St., N. Y.
Jos. Dixon Crucible Co., Jersey City, N.J.
Warren Chemical & Mfg. Co., N. Y. City.

Patents
Howson & Howson, 119 So. 4th St., Phila.
Geo. P. Whittlesey, Washington, D. C.

Phosphor-Bronze
Paul S. Reeves, Philadelphia.
Phosphor-Bronze Smelting Co., Phila.

Piling
American Supply Co., Kansas City, Mo.

Pile Drivers
Bucyrus (O.) Steam Shovel & Dredge Co.
Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 96 Liberty St., N. Y.
Vulcan Iron Works, Chicago, Ill.

Pipe Cutting & Threading Mach.
D. Saunders' Sons, Yonkers, N. Y.

Pneumatic Foundations
S. W. Fresconi, World Bldg., N. Y.

Portable Drills
Frank Reed, Worcester, Mass.
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.

Pressed Steel
Schoen Mfg. Co., Pittsburgh, Pa.

Pulley Blocks
Boston & Lockport Block Co., Boston.

Pumps
Fairbanks, Morse & Co., Chicago.
Laidlaw & Dunn Co., Cincinnati, O.
Valley Pump Co., Easthampton, Mass.
R. D. Wood & Co., Philadelphia, Pa.
H. R. Worthington, 95 Liberty St., N. Y.

Radial Taps
J. T. Connelly, Milton, Pa.

Rails
American Supply Co., Kansas City, Mo.
Bethlehem Iron Co., 80 Broadway, N. Y.
Cambria Iron Co., Johnstown, Pa.
O. W. Child & Co., 115 Broadway, N. Y.
Geo. A. Evans, 40 and 42 Wall St., N. Y.
Humphreys & Sayce, 10 Wall St., N. Y.
Illinois Steel Co., Chicago, Ill.
A. S. Males & Co., Cincinnati.
N. Y. Equipment Co., 15 Wall St., N. Y.
Pennsylvania Steel Co., 2 Wall St., N. Y.
Robinson & Orr, Pittsburgh, Pa.
A. S. Whiton, 115 Broadway, N. Y.

Rail Fastenings
American Supply Co., Kansas City, Mo.
Cambria Iron Co., Johnstown, Pa.
Fisher Rail-Joint Works, Trenton, N. J.
A. S. Males & Co., Cincinnati.
Metcalf, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark, N.J.
N. Y. Equipment Co., 15 Wall St., N. Y.
Morris Sellers & Co., Chicago.
Ruffner & Dunn, Philadelphia, Pa.

Rail Saws
Bryant & Barbey, 79 Milk St., Boston.
Industrial Works Bay City, Mich

Railroad and Transp. Lines
Big Four.
Boston & Albany.
Chicago & Alton.
Chicago, Burlington & Quincy.
Chicago, Milwaukee & St. Paul.
Chicago & Northwestern.
Chicago, Rock Isl. & Pacific.
C., H. & D.
Hoosac Tunnel Route.
Illinois Central.
Lehigh Valley R. R.
Michigan Central.
Missouri Pacific.
New York Central & Hudson River.
New York, Lake Erie & Western.
New York & New England R. R.
Pennsylvania.
Stonington Line.

Railroad Printing
W. H. Campbell, 19 Union Sq., N. Y. Cy
C. F. Ketcham & Co., 27 Nassau St., N. Y.

Railroad Supplies
Bryant & Barbey, 79 Milk St., Boston.
Reginald Canning & Co., 115 B'way, N. Y.
O. W. Child & Co., 115 Broadway, N. Y.
Fairbanks, Morse & Co., Chicago.
A. S. Greeley & Co., 7 Dey St., N. Y.
Intern. Ry. Equipm. & Supply Co., N. Y.
The Johnson R. R. Signal Co., Rahway.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
N. Y. Railway Supply Co., 40 Wall St.
G. D. Peters & Co., London, England.
A. T. Shoemaker, Chicago and N. Y.

Railway Varnishes & Surfacers
Flood & Conklin, Newark, N. J.

Ratchet Drills
Billings & Spencer Co., Hartford, Conn.
Schuttler Mfg. Co., Chicago.

Reducing Valves
Curtis Regul. Co., 69 Beverly St., Boston.
Mason Regulator Co., Boston, Mass.

Refined Iron
Falls Hollow Staybolt Co.

Refrigerator Cars
R. M. Pancoast, Camden, N. J.
Sec. & Pac. Refrigerator Car Co., Chicago.

Refrigerating Machinery
De La Vergne Refrig. Machine Co., N.Y.

Rivets, Slotted
J. A. Thomson Mfg. Co., Waltham, Mass.

Rock Ballast and Rock Breakers
Gates Iron Works, Chicago, Ill.

Rock Drills
Ingersoll-Sergeant Rock Drill Co., N. Y.
Rand Drill Co., 23 Park Place, New York.

Roofs
Berlin Iron Bridge Co., E. Berlin, Conn.
King Iron Bridge Mfg. Co., Cleveland,O.

Rolling Stock to Lease
Oliver Adams, 22 Liberty St., N. Y.

Rubber Belting
N. Y. Belting & Pack. Co., 15 Park Row.

Safety Valves
Ashton Valve Co., Boston, Mass.

Saw Mills
Richmond (Va.) Loco. & Mach. Wks.

Second-Hand Rolling Stock
A. S. Males & Co., Cincinnati.

Sewer Pipe
Blackmer & Post, St. Louis, Mo.
R. D. Wood & Co., Philadelphia, Pa.

Sewerage
J. J. R. Croes, 13 William St., N. Y.

Shafting
Wm. Sellers & Co., Phila.

Skylights
Vaile & Young, 209 No. St. Baltimore, Md
E. Van Noorden & Co., Boston.

Signals.
Hall Signal Co., 80 Broadway, N. Y.
Johnson R. R. Signal Co., Rahway, N. J.
Kelsey R. R. Signal Co., Florence, Mass.
Union Switch & Signal Co., Pittsburgh.
Nat. Switch & Signal Co., So.Bethlehem, Pa.

Snow Shovels and Plows
Jull Mfg. Co., Brooklyn.
Leslie Bros. Mfg. Co., Paterson, N. J.

Solid Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.

Spikes
Dilworth, Porter & Co., Pittsburgh, Pa.
Q. & C. Co., Chicago.
Morris Sellers & Co., Chicago.

Springs
Atkinson Steel & Spring Works, Chicago, Ill.
Farist Steel Co., Bridgeport, Conn.
A. French Spring Co., Pittsburgh, Pa.
Pickering Spring Co., Philadelphia.
Chas. Scott Spring Co., Philadelphia, Pa.

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John M. Peage, Cincinnati, O.
King Iron Bridge Mfg. Co., Cleveland,O.
Sheffield Veloc. Car Co., Three Rivers, Mich.

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Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Fuller Bros. Co., N. Y.
B. M. Jones & Co., Boston & N. Y.

Steam Coupling
Moran Flex. Steam Joint Co., Louisville, Ky.

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Cambria Iron Co., Johnstown, Pa.

Steel—Mushet's
B. M. Jones & Co., 11 Oliver St., Boston.

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Chester Steel Castings Co., Philad'a., Pa.
Eureka Cast Steel Co., Philad'a, Pa.
Sharon Steel Castings Co., Sharon, Pa.
Solid Steel Co., Alliance, O.
Pratt & Letchworth, Buffalo, N. Y.

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Schoen Mfg. Co., Pittsburgh, Pa.

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Lukens Iron & Steel Co., Coatesville, Pa.

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Midvale Steel Co., Nicetown, Phila.
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Thos. Prosser & Son, 15 Gold St., N. Y.
Standard Steel Works, Philadelphia, Pa.

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New Jersey Car Storage & Repair Co., Lake View, N. J.

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Johnston R. R. Frog & Switch Co.
Kelsey R. R Signal Co., Florence, Mass.
Nat. Switch & Signal Co., So.Bethlehem, Pa.
Pennsylvania Steel Co., Steelton, Pa.
Ramapo Iron Works, Ramapo, N. Y.
Sheffield Veloc. Car Co., Three Rivers, Mich.
Union Switch & Sig. Co., Pittsburgh, Pa.
Weir Frog Co., Cincinnati, O.

Tanks (Cedar)
G. I. Burkhardt's Sons, Philadelphia, Pa.
Fairbanks, Morse & Co., Chicago.

Tank Valves
John M. Peage, Cincinnati, O.

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D. Saunders' Sons, Yonkers, N. Y.

Testing Laboratory
Pitts. Testing Laboratory Pittsburgh, Pa

Telegraph Call-Bell System
Electric Secret Service Co., N. Y. City.
Gill-Alexander Electric Mfg. Co., Kansas City, Mo.

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Cleveland City Forge & Iron Co., Cleveland, O.

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Wm. Sellers & Co., Phila. and N. Y.
Shiffler Bridge Co., Pittsburgh, Pa.

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Ashton Valve Co., Boston.
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Ludlow Valve Mfg. Co., Troy, N. Y.
Mason Regulator Co., Boston, Mass.
Ross Valve Co., Troy, N. Y.
R. D. Woods & Co., Philadelphia, Pa.

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Flood & Conklin, Newark, N. J.
Murphy & Co., Newark, N. J.
Edw. Smith & Co., Times Bldg., N. Y.

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RAILROAD GAZETTE

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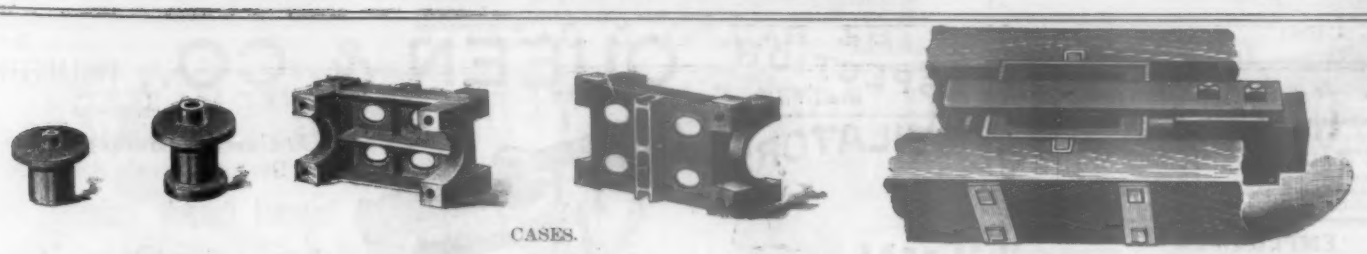

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In a coupler confined to the M. C. B. lines it is impossible to distribute 36½ lbs. of steel in a knuckle having a pivot hole, buffing against the side of the drawhead, thereby causing a shearing strain, which breaks the knuckle and lugs from the drawhead and bends the pivot pin, making it inoperative. It is a mechanical impossibility for such a coupler to stand the strain of 60,000-lb. cars (which are 20,000 lbs. heavier than when the pivot type was first introduced).

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One reason why this particular pivoted drawhead breaks more largely than the Dowling type is explained by the fact that in order to allow the lock to rotate on an additional pivot pin in the guard arm the head is cut away so that it cannot be strengthened in its weakest part.

Official records of several of the leading railways of the East and West show average breakages of 6 to 7 drawheads and 3 to 4 knuckles of this form of coupler to one each of the Dowling type, which we think is conclusive evidence that the above claims are well founded.

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To the managers of these railways we will say, if you think with us, that it is not sound business policy, nor for the interests of the corporations which you manage, to foster this attempt to form a colossal coupler monopoly, involving, as it does, the eqiupment and maintenance of more than a million freight cars, with the addition of at least one hundred thousand new cars annually, and if you will open your doors to the competition of the Standard Company, you will be able to equip and maintain your cars at a very much lower cost than many companies are now paying.

Based upon the present cost of iron and steel, the million or more freight cars of the United States can be equipped with the Dowling and other first-class couplers for considerably less than eighteen millions of dollars instead of twenty-five millions or more, which is the ultimate aim of a coupler monopoly; and these cars can be maintained for five hundred thousand dollars per year, or fifty cents per car.

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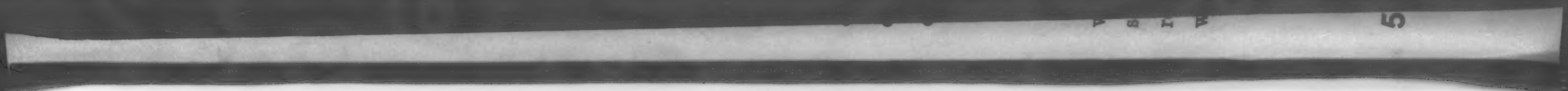

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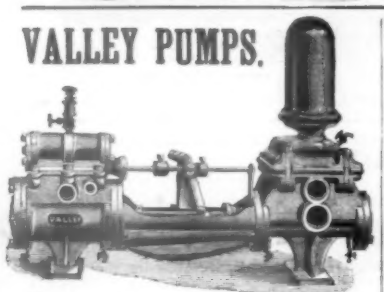

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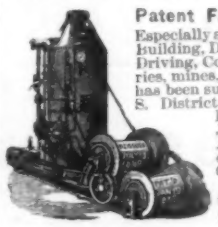

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RAILROAD GAZETTE

FRIDAY, FEB. 19.

CONTENTS.

Contributions.

Spokes of Driving Wheels.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Can a good reason be given for making the arms or spokes of locomotive engine driving wheels oval in cross section? The arms are essentially beams, supported at one end and loaded at the opposite end, since the heaviest strains are caused by side thrusts against the rails.

It would not be considered good practice to use beams or columns of an oval cross section where the greatest strength is desired; then why use such forms in driving wheels? Can any better reason be given than that such a form of the arms has a better appearance, and is it certain that such is the case?

In most machinery matters, the "curved line of beauty" has vanished; and is it not true that modern machinery has a better appearance than the old forms? A safe rule, in designing heavy machinery, is to so design as to serve the purpose best. In reality, a handsome appearance is the result.

This query is brought to my mind as a consequence of having to cast steel driving wheels and driving wheel centres. If there are reasons other than those suggested for conforming to the usual practice, I would be glad to learn of them. W. G. RICHARDS.

Railroad Building in Texas.

Texas Central Railway,
General Manager's Office,
WACO, Tex., Feb. 6, 1892.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am in receipt of a communication from your office asking for information concerning the reported extension of the Texas Central Railway, and am surprised that a well informed paper like the *Railroad Gazette* is not better posted than to ask such a series of questions at such a time concerning railroads in Texas.

Have you not observed that capital has been invited to stay out of Texas, by a circular headed "Alien Land Law," issued by the Farmers' Alliance Legislature, and approved by Governor Hogg? Are you not advised of the passage of an act establishing a Railroad Commission for the State of Texas, with power to fix rates, make classifications, make divisions between lines, etc., etc., and that this Railroad Commission, in its wisdom, has made rates and divisions on lumber, coal, cotton seed and like commodities, of less than one cent per ton per mile, notwithstanding that the railroads in Texas, being so far off from the base of supplies, cannot be built nor operated as cheaply as railroads in the more densely populated localities with a continuous traffic the year round, while in Texas the principal business they do, namely, moving the cotton crop at a very low rate, is all done in four months of the year?

Did you not know that the railroads, as well as other interests in Texas, had been paralyzed by hostile legislation, notwithstanding that Texas is in greater need of more railroad facilities than any other state in the Union and were you not advised that this adverse and hostile legislation is wrecking private enterprises, closing up business concerns and palsying all kinds of interests?

Have you not found in your search for railroad news of interest that taxes assessed against railroads in Texas are greater than in any of the northern states, where land is worth ten or twelve times as much, and where the railroad itself did not cost half as much, and did you not ascertain at the same time that in addition to the taxes, which are enormously high, the state extorts an income tax from railroads in the shape of one per cent. assessment upon the gross passenger earnings of the railroads, which they are compelled to pay into the state treasury quarterly?

It would afford me a great deal of pleasure to answer your inquiries, and give you the information asked for, but the prospect of building new lines or the extension of old, is so very remote that it will be a long time before you will be able to publish any such statistics regarding railroads in Texas. CHARLES HAMILTON,
General Manager.

[We confess judgment. Our questions were superfluous.—EDITOR RAILROAD GAZETTE.]

Tie Plates.

BY BENJAMIN REECE.

The channel form of wear plate, known as the Servis tie plate, has developed so many features as a rail fastening that the preservation of ties against the cutting in of rail flanges for which it was originally designed, has become an incident of its application rather than the entire purpose of its use. The distinctive feature of the Servis tie plates is their flanges, which are forced into the ties in the direction of the grain. As shown in fig. 1, the wide and narrow plates are in general form

Fig. 1.

channel irons. The narrow plate is designed for soft wood ties subjected to moderate traffic, and for oak ties which cut in under very heavy traffic. The wide plate is reinforced with a centre stiffening rib, and is applied to soft wood ties under heavy traffic, to joint ties, and when additional spiking is required because of exceptional strains on very sharp curves, heavy grades, etc.

From the earliest days of construction to the present time various forms of tie plates and chairs have been used, but after trials of greater or less extent they have developed defects which changes and modifications failed to correct, leading to the abandonment of their use. When tie plates or chairs have been made of such thickness of metal as would preserve the general elasticity of the tie, they have buckled up at the points of contact with the flanges of the rail, as shown in figs. 2 and 3. The resultant force of a moving train, especially on curves, tends to force the outer flange of the rail down into the tie, as shown in fig. 3. Any weakening of the plate at this point caused by punching spike holes or stamping projecting shoulders, will result in the buckling of the plate. In other words, the portion of the plates where the flanges of the rail *impinge* must be sufficiently stiff to carry the ends of the tie plate down into the tie should the fibre yield or compress under the portion of the plate surmounted by the rail, and any diminution of metal in the plate on the spiking line along the edges of rail flanges must vitally impair the value of any tie plate unless such weakening by reduction of metal is otherwise compensated. When plates or chairs have been made sufficiently heavy to prevent such buckling they have proved too unyielding and have operated as anvils upon which the rails received the blows of passing wheels to their own destruction. Complaints common to all forms of plain-bottomed plates as well as those having flanges cutting crosswise of the grain, whether they were heavy or light in form, were the rattling and the tendency of the tie to rot under the plates.

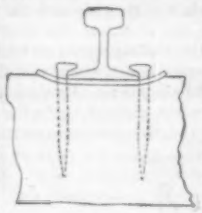


Fig. 2

The depending flanges entering the tie in the direction of the grain are the distinguishing feature of the Servis tie plate, and six years' experience has shown that they fully correct the numerous evils which have attached to other forms of tie or wear plates. It is self-evident that the flanges give stiffness to an otherwise light plate, the degree of stiffness required being secured by the form or number of the flanges used, and in the light of past experience the wide and narrow plates are properly proportioned for the service to which they are subjected. Experience has proved them to be secure against buckling at the ends and the thin plates fastened and bedded in the ties by the flanges have not only saved the rail from anvil wear, but to the contrary, as will hereafter appear, they have in marked manner tended to prolong the life of rails as well as ties. While the flanges were originally intended to give stiffness to the plate, they have proved of inestimable value in the correction of other serious objections urged against other forms of plates. In bedding the plates to the ties they become consolidated to and act as a part of the tie; they have no motion apart from that of the tie itself, In being so bedded, vibration is prevented and rattling is impossible.

Fig. 3.

Experience has demonstrated beyond any question that no plate loosely applied between rail and tie can be depended upon to properly perform the duties of a wear plate. The plate must be either fastened to the base of the rail or securely bedded in the tie, so that the moving load will be directly communicated and distributed from the rail to the tie through the medium of the plate so secured. When the plates rest loosely between rails and ties the effect of the forces in action and reaction can be realized by calling to mind past experience with the old type stub-switch head-chairs. From use the Servis tie plates become so perfectly bedded in the ties that considerable force is required to extract them, and when ties are removed from the track the jar incident to throwing them aside or loading them on cars is insufficient to loosen them. This fact so obviously accounts for the entire absence of rattle or clatter that further comment is unnecessary.

Another advantage derived from the flange form is evidenced in the fact that the flanges, when inserted, confine the fibres of the tie which they inclose, hence the fibres become consolidated and compressed under the pressure of repeated loads, and the tie does not fail by abrasion, as under the action of the rail base on an unprotected tie. In this manner the fact is accounted for that the 3½-in., or narrow Servis tie plate has afforded ample protection to ties where rails of 5-in. rail base subjected to the same traffic have badly cut into the ties. This compression of the fibres directly tends to close the pores, permitting less moisture to be absorbed, thereby preventing decay, while for the rail is secured a uniformly compressed bearing on the ties, independent of their ages, which materially adds to the benefits derived from thorough tamping under the tie.

With this summary of the general features of the Servis or channel tie plates we now proceed to show some of its special features which have been revealed by its use.

Fig. 4 represents the position of the rail when found in tracks subjected to side push or lateral thrust, as on curves, turn outs, etc. In a modified and less aggravated form the same features can be observed with soft wood ties even on a straight track. Examination of such track, which is by no means exceptional, discloses an excessive wear on the inner line of the head of rail as appears in fig. 4; the figure also shows that the head of the inner spike is lifted and pressed back by the wedge-like form of the rail flange, while the outer flange of rail has cut down into the tie, settling away from the spike as shown. It is evident that in such cases the incumbent weight operates in part to overturn the rail, and if the tie is not adzed and the vertical position of the rail restored as shown in fig. 5, the track soon becomes dangerous. Every time the rail is brought to its normal position the redriving of spikes is made necessary, and on sharp curves this is quite frequently required, so that ties soon become "spike" killed. This is particularly true when the resetting of rail braces is involved.

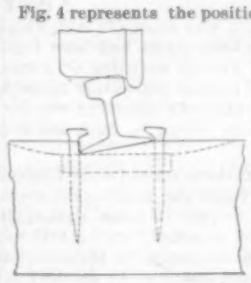


Fig. 4.

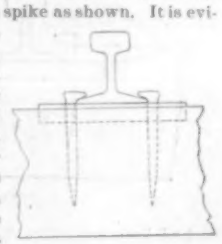


Fig. 5.

Fig. 6 represents a rail brace as it rocks and is pushed out in its effort to support a canting rail, which more slowly, but just as surely, sinks its outer flange into the tie. The rail brace affords no support for the base of the rail, but essays to prop it up under the head with the same results, in less degree, as to position and wear of rail as shown in fig. 4.

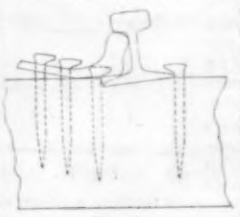


Fig. 6.

Fig. 7 represents the rail restored to its normal position, the tie having been adzed to a level bearing and the plate applied. It will be noted that the wear on the rail head is on the outer line, the old line of wear on the running side

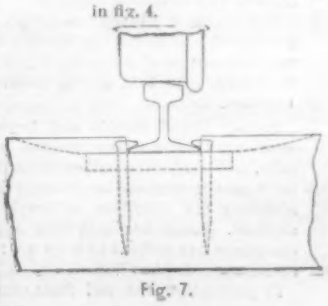


Fig. 7.

of rail being untouched by the tread of the wheel, it soon presents a line of rust which is very noticeable in contrast. This feature was generally remarked by those who examined the Servis tie plates in the Harrison street curve of the Union tracks in the Chicago yards of the P., F. W. & C. Ry. Another striking example of this effect was to be found in the Norwalk yards of the Wheeling and Lake Erie. Over three years ago some trial plates were placed in a curve at that station; the rail which was to have been taken out was purposely left in the track to add to the severity of the test. The changed point of wear on the rails so operated to correct their shape that they were left in the track until last June, and without additional labor, because of the efficiency of the plates it was found practical to extend the service of these rails for a period of nearly three years.

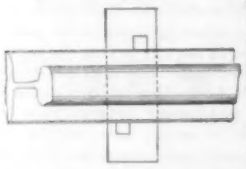


Fig. 8.

By looking at fig. 9 it will be seen that the spikes which fasten the rail brace and those securing the rail to the tie have no connection, whereas, as shown in fig. 8, and others, the spikes which pass through spike holes of the tie plates, are literally locked together, and in order to spread the gauge it compels the pushing of plate and spikes bodily through the fibre of the ties. The plates so bedded and spiked under each rail in connection with the tie substantially afford the advantages of a tie rod for holding the rails to gauge.

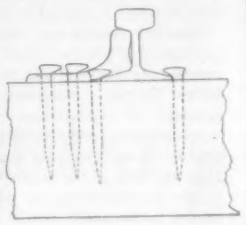


Fig. 9.

On the Denver & Rio Grande, in the heart of the Rocky Mountains, the Servis tie plates were tested against rail braces. The place selected was on a series of curves ranging from two to twelve degrees on a continuous equated grade of 158.4 ft. to the mile. Upon inspection the plates in only one case disclosed a variation so high as one-eighth of an inch in excess of the 4 ft. 9 in., to which the track was originally laid, whereas the rail braces, which in some places had been applied to every tie, showed an average widening of gauge of nearly one-half inch, and in some places this figure was exceeded. Much of this apparent spreading was due to the canting of the rails as shown in fig. 6, which the braces failed to prevent.

In a very sharp curve at the south end of the Louisville Bridge, where by actual count the movements average to exceed 1,000 cars per day, the tie plates were applied without rail braces, and although for more than 15 months they have been subjected to this enormous traffic, they have held and continue to securely hold the rail to place.

Fig. 10 shows the application of the tie plate to ties already partly cut in under the rail; in such cases the tie should be adzed as shown, the plate inserted and further cutting will be prevented. Six years ago, the Maine Central made such an application of the plates on cedar ties which had been subjected to two years' service. The same ties are still in the track in good shape, giving promise of some years' further wear. Since their first application this line has used several hundred thousand of these plates with results that have been eminently satisfactory. Fig. 11 represents the faulty application of the plates to old ties where no attempt is made to secure an even bearing by adzing. Thus applied, the plates simply resting on their ends must necessarily buckle to the extent of finding a centre bearing; it is hardly necessary to inveigh against such careless and irrational methods.

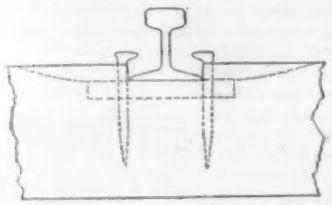


Fig. 10.

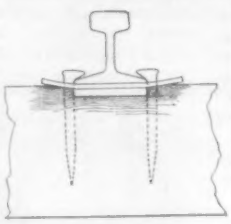


Fig. 11.

The Boston & Albany has adopted the plate as standard in order to secure the benefits enumerated, and to take advantage of its general features as a secure rail fastening, to aid in giving them the best track obtainable.

On the Grand Rapids and Indiana, a few thousand were used on a shaky swamp when the creeping of rails, and the tie and ballast disturbance, were so marked as to greatly increase the labor of maintenance notwithstanding the condition of track remained below the average. Since the plates were applied less labor than elsewhere has sufficed to keep up the track to the general standard of the line.

In preventing the rail from cutting into the tie the movement of the rail is greatly reduced, hence less lifting of spikes, and the base of the rail being more closely confined between the plate and spike heads, its undulations are minimized and the creeping of rails is measureably lessened while the spikes are saved from the destructive wear shown in fig. 12.

Fig. 12.

Further references showing the efficiency of the Servis tie plate might be enumerated and described, but those given, showing the value in the preservation of track gauge, as a protection to ties against the cutting in by rail flanges, its value in adding to the life of rails by securely holding them in normal position, the decreased oscillation to moving trains, the general betterment of track where the plates are in use, as well as their acknowledged saving in the labor of track repairs, all tend to prove that the Servis tie plate strikes fundamentally at the cause of many observable defects from which tracks now suffer.

Buildings and Structures of American Railroads.*

NO. 15.—COALING STATIONS FOR LOCOMOTIVES.

(*Continued from Page 96.*)

BY WALTER G. BERG, C. E.

Derrick Coal House, Northern Pacific Railroad.—The Northern Pacific has a standard derrick coal house, shown in figs. 1 and 2, designed by Mr. C. B. Talbot, that is an excellent example of a first-class plan for the stationary crane and bucket system of coaling engines. The plan consists of a low shed 18 ft. wide and 250 ft. long, with a derrick house 18×28 ft. at the centre. Along the face of the shed is the coaling track, on which engines stand opposite the derrick house when receiving coal, while on the rear of the shed is an elevated coal supply track, raised 6 ft. from the ground, to facilitate derrick house, raised there by the derrick through trap-doors to the upper floor, and placed around the derrick till needed, when they are swung out over the tenders and discharged. The height of the shed is 10 ft. 9 in. in the clear from floor to tie beam. The derrick house is partially open toward the track, and the derrick is built and set as shown on plans. This design allows of the use of either one shed only on one side of the supply track, or of sheds placed on both sides of the same, with an additional coaling track on the rear.

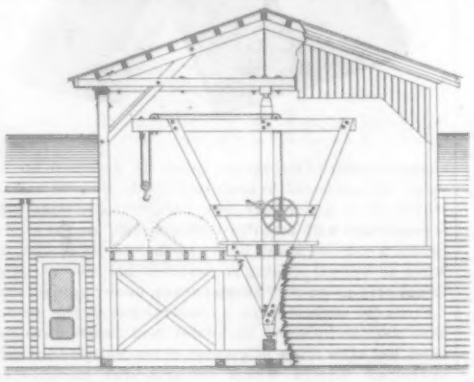


Fig. 1.

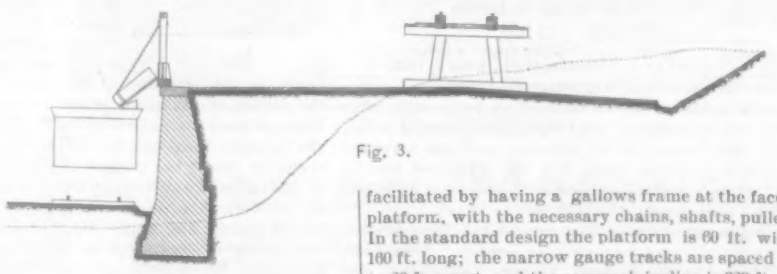


Fig. 3.

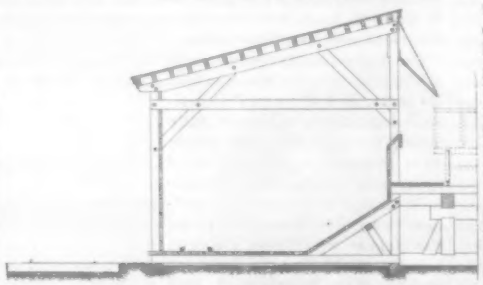


Fig. 2.

Coaling Platform at Lehighton, Pa., Lehigh Valley Railroad.—The coaling platform, shown in fig. 3, designed by the writer, illustrates the system of delivering coal to engines from a platform by means of movable hand trucks or barrows over fixed revolving aprons along the face of the platform, the coal supply being dumped on the rear of the platform from a low dumping trestle. The approach to the dumping track is on an embankment on a gradient of 4 ft. rise in 100 ft. horizontal. The platform, 50 ft. wide by 275 ft. long, is located along a hillside, and is mainly in original ground. The face of the platform consists of a stone wall, varied in its dimensions according to the amount of new filling back of it. The wall is coped with stone coping, 34 in. wide by 12 in. thick, with an 8 in. × 14 in. oak combing stick anchored to the masonry.

Along the face of the combing, at distances of about 60 ft., light timber gallows frames are erected with a chain drum operated by hand for raising and lowering aprons hinged to the timber combing. The floor of the platform consists of stone flagging. The centre of the dumping trestle is placed 30 ft. back from the face of the platform. The top of the floor of the platform is 11 ft. above the top of the rail of the coaling track; the top of the rail on the dumping trestle is 8 ft. above the floor of the platform. The face of the front wall at the height of the coaling track is placed 6 ft. 1 in. from the centre of the coaling track. The face of the wall has ¼-in. batter. The face of the timber combing is 6 ft. from the centre of the coaling track.

The force employed at this coaling station consists in general of five men during the day, and three men at night. The rate of wages is 12 cents per hour. There are from 100 to 120 engines coaled every 24 hours, each engine taking from two to seven tons of coal. The barrows hold one ton, so that the number of barrows to dump is small. When rushed seven tons of coal are dumped in six minutes including lowering and raising the apron. According to the assumed daily output the cost of delivery to tenders from the platform will be from 2½ to 5 cents per ton, to which must be added the cost of dumping from the trestle track into stock, and an extra allowance for interest on first cost and for the expense of maintenance, which latter item, however, is small, owing to the substantial character of the structure. On the basis of above data the cost would probably fluctuate from 5 to 10 cents per ton.

Coaling Platform, St. Louis, Iron Mountain & Southern Railway.—The coaling platform design shown in fig. 4 consists of a platform, 12 ft. 4 in. above the top of rail, with a supply track at the centre of the platform, level with the floor. The coal is shoveled from the road cars on this supply track, either to the rear of the platform into store, or toward the face of the platform for immediate use. There are narrow gauge tracks running perpendicularly to the face of the platform, on which large wooden tipping coal buggies run. The face of the buggy consists of an iron flap, which, when the buggy is tipped, serves as an apron. The tipping of the buggy is facilitated by having a gallows frame at the face of the platform, with the necessary chains, shafts, pulleys, etc. In the standard design the platform is 60 ft. wide, and 160 ft. long; the narrow gauge tracks are spaced from 20 to 28 ft. apart, and the approach incline is 329 ft. long on a grade of 3.75 ft. in 100 ft.

Elevated Coal Shed Northern Pacific Railroad.—The elevated coal shed, shown in fig. 5, designed by Mr. C. B. Talbot, consists of a covered platform with a narrow gauge track running lengthwise of the shed connecting by turntables with tracks running out over the coaling track on counter-balanced platforms or drawbridges, the coal being discharged into the tenders by small narrow gauge tipping trolley dump cars, which are loaded in the house from the storage pile, turned on the turntable, run out on the drawbridge and tipped. The coal is put into the shed through openings in the side sheating by shoveling from cars on an elevated track along the back of the shed. The platform in the shed is 14 ft. wide and the floor is placed about 12 ft. 6 in. above the coaling track. The shed can be made any length desired, the standard plan shows it to be 240 ft. long with a rated capacity of 500 tons. For this length of house there are two turntables and drawbridges for discharging to tenders. The elevated coal supply track on the rear of the shed is placed 3 ft. 6 in. below the floor in the shed. The clear height of the shed above the floor is 8 ft. The centre of the coaling track is placed 6 ft. from the face of the building.

Coal Chutes, New Orleans & Northeastern Railroad.—The standard coal chute of the New Orleans & Northeastern, part of the Cincinnati, New Orleans & Texas Pacific, lessee Cincinnati Southern Railroad, shown in fig. 6, consists of a high trestle track, from which coal

*Copyright, 1890, by Walter G. Berg, and condensed from a forthcoming book on the subject.

is dumped on to a platform and then shoveled as required into a series of pockets along one side of the platform. The high track is 25 ft. 6 in. above the coaling track in front of the pockets and 7 ft. 4 in. above the floor of the platform. The bottom of the pocket is set 11 ft. above the top of the rail of the coaling track. The width of the structure is 29 ft.

The bottom of the pockets is lined with $\frac{1}{10}$-in. sheet iron. The apron is counterweighted, as shown, and the bottom of the pocket is closed by a flap door, which is

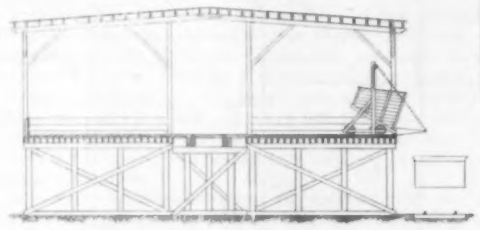


Fig. 4.

opened and closed automatically with the lowering and raising of the apron. The apron is 5 ft. long. The pocket and apron slope 45 degrees.

Coal Chutes at Wilkesbarre, Pa., Lehigh Valley Railroad.—The coal chutes of the Lehigh Valley Railroad, at Wilkesbarre, Pa., designed by Mr. A. Mitchell, Division Superintendent, shown in fig. 7, consist of a series of pockets, with a dumping track running directly over them, the entire structure being covered. The rail of the dumping track is placed 24 ft. above the rail on the coaling track, which runs along one side of the building. The approach incline is built on a gradient

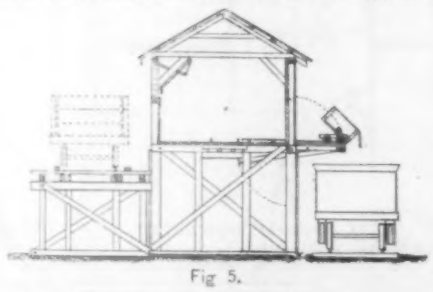


Fig 5.

of 5 ft. per 100 ft. There are 15 pockets in the building, all used for hard coal. The lower end of the pocket is placed 11 ft. 6 in. above the rail of the coaling track; and the slope of the bottom of the pocket is 5 in. in 12 in., or at an angle of about 22½ degrees. The pocket has a counterweighted apron, and is closed by a lifting door. The shed over the pockets and dumping track has 15 ft. clear height above the rail and 18 ft. 8 in. clear width. Some of the pockets are used for fine coal, such as buckwheat and pea coal, and others for lump coal. The lump coal pockets have screens in the bottom, screenings being collected, as shown in the sketch, in small coal cars placed underneath the pockets. When full these cars are transferred to the upper track and the coal is dumped into the fine coal pockets.

The average amount of coal handled over these chutes daily is about 300 tons. The engine service is performed by the switching engine employed at the shops in the immediate vicinity. The force regularly employed on the chutes consists of two day men and one night man, who dump the coal from the cars into the pockets and discharge the pockets, the rate of pay being 12½ cents per hour. The average cost, therefore, of dumping into store and discharging to engines will be about 1.5 cents per ton, exclusive of engine service, interest on first cost and maintenance of the structure.

Coaling Station, with Vertical Bucket Elevator, at Jersey City, N. J., National Docks Railway.—The coaling station, designed by Mr. F. M. Slater, Engineer National Docks Railway, shown in figs. 8 and 9, is for the joint purpose of coaling locomotives and furnishing coal to a boiler house, but the illustrations herewith have been changed so as to show coal chutes for locomotive delivery throughout. The timber structure is 14 ft. 6 in. by 50 ft. by 34 ft. high with storage bins of a total capacity of about 200 tons in the upper part of the structure. The bins on one side of the centre of the building slope backwards for delivery of coal to the boiler house on the rear of the coal chutes, while the bins on the other side of the centre slope forward for coal delivery to locomotives on a coaling track in front of the chutes. The bins are hopper bottomed and those for delivery to locomotives are closed at the lower end with gates and counterweighted aprons in the usual way. The coaling track

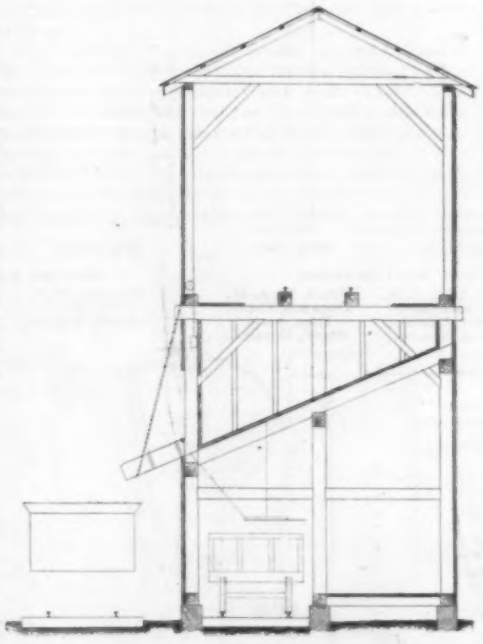


Fig. 7.

serves also as coal supply track, the coal being dumped from cars on the coaling track into an underground pit under the track opposite the centre of the structure. This pit guides the coal to the foot of a vertical endless bucket elevator with 39 ft. vertical lift, which hoists the coal up and discharges it at the head to the bins on both sides, a proper switch arrangement being provided at the head to feed the coal to any particular bin desired. The elevator is run by an 8-H. P. vertical engine. The buckets are 9 in. by 12 in. by 14., spaced 12 in. apart on the belt. The uptake capacity is stated to be 85 tons per hour. The machinery was furnished by the Link Belt Engineering Co., of Philadelphia, Pa.

This system can be highly recommended for all localities where the ground space available does not allow the usual methods for taking coal up to high chutes to be employed or the daily output does not warrant the construction of a costly and large coal chute system. Where steam can be drawn from a boiler in the vicinity of the coaling station the same men that dump the coal can operate the elevator engine at any time without requiring an engineer or having to get up steam in a special boiler attached to the engine. Where the coaling track is also used for a running track and there is space behind the chutes, it will prove more advantageous to locate the coal supply track with

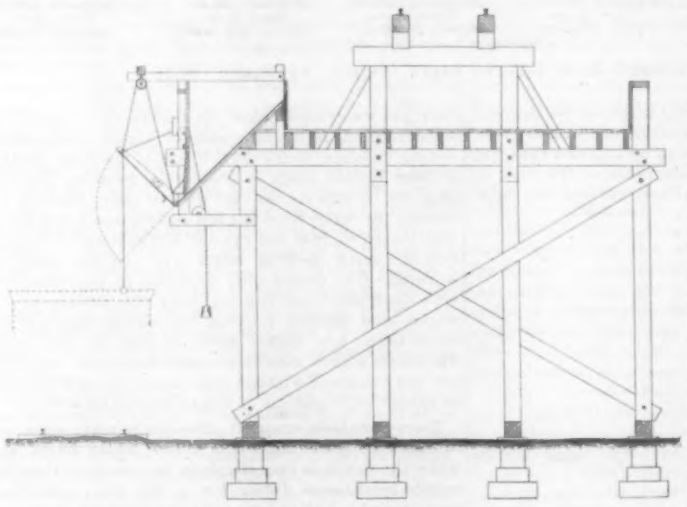


Fig. 6.

dumping pit and elevator on the rear of the building. The cost of handling coal for a small coaling station on this system will prove less than over any of the platform systems and will be as cheap as in a high chute system, if the diminished first cost and maintenance in the elevator system is taken properly into account.

Coaling Station with Trough Conveyor Elevator at Oneonta, N. Y., Delaware & Hudson Canal Co.—The coaling station of the Delaware & Hudson Canal Co., at Oneonta, N. Y., consists of a set of elevated pockets, the coal being carried up to the proper elevation for filling the chutes by an inclined trough conveyor, designed and built by the Link Belt Engineering Co., of Philadelphia, Pa. The pockets are 60 ft. long by 20 ft. wide by 16 ft. deep, and are 30 ft. high from the ground level to the top of the pocket, the storage capacity being 200 tons. The location is parallel to the main tracks, and four chutes with properly constructed aprons allow the coal to be delivered to tenders on the second track in front of the chutes, the track next to the chutes being used as a dumping track only. The incline for the trough conveyor is only 80 ft. long, so that the entire structure and approach do not occupy more than 150 ft.

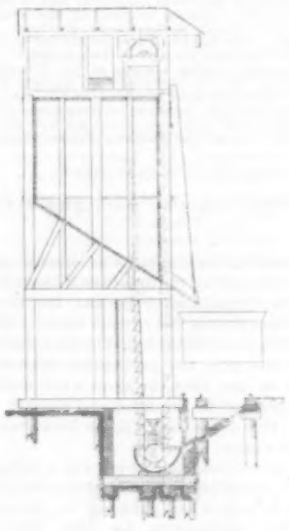


Fig. 9.

in length. Coal is delivered to the foot of the elevator by dumping from cars on the nearest track into a pit below the track, as shown on the plans. In addition to the storage in the pockets, surplus storage on the ground is provided on the rear of the pocket, where a storage pile on the Dodge Storage System is used, from which pile coal is fed to the foot of the incline, when required. It is claimed that in this system the timber structure and ground space occupied are reduced to a minimum, while the trough conveyor does not damage the coal. The cost of elevating the coal is only nominal and a very large amount of coal can be carried in stock by the introduction of a Dodge storage pile at the foot of the incline. The plant has been working successfully at Oneonta since 1888.

For obtaining additional data on coaling stations for locomotives, the following references will prove useful:

In the report of the American Railway Master Mechanics' Association, adopted in 1887, data are given relative to the stationary crane and bucket system, as in use on the Des Moines & Fort Dodge Railway and on the New York, Chicago & St. Louis.

In the issue of the *Railroad Gazette* of April 1, 1887, the traveling crane for coaling engines, at Columbus, O., on the Pittsburgh, Cincinnati & St. Louis Railway, is illustrated and described. The same plant is also mentioned in the report of the Master Mechanics' Association, referred to above.

In the last mentioned report data and plans are published relative to the system of coaling locomotives from coaling platforms with fixed, tipping boxes or pockets along the face of the platform in use on the Chicago & Grand Trunk Railway. The same report gives data from the Connecticut River Railroad, from the New York, Chicago & St. Louis Railroad and

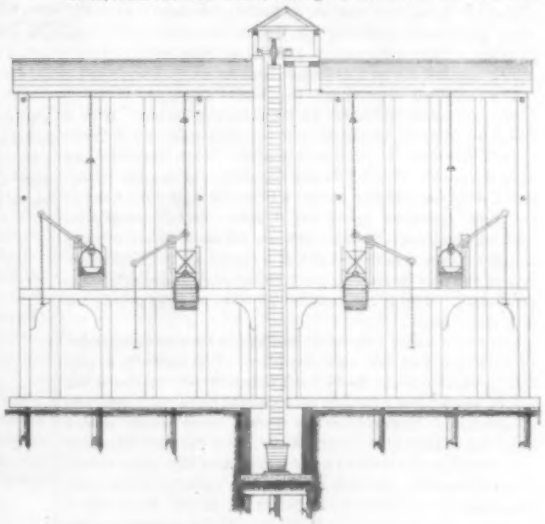


Fig. 8.

from the Northern Central Railroad, which roads use the system of tipping trolley dump cars running on tracks perpendicular to the face of the platform.

The *Railroad Gazette* in its issue of Sept. 15, 1882, published plans of the coaling platforms of the Pennsylvania Railroad at Altoona, Pa., at West Philadelphia, Pa., and at East Tyrone, Pa., where coaling platforms with tipping trolley dump cars in connection with transverse and longitudinal tracks are used.

The standard elevated coal chute system of the Baltimore & Ohio Railroad was published in the *Railroad Gazette* of Sept. 15, 1882.

In the issue of the *Railroad Gazette* of Oct. 5, 1883, plans and descriptions were published of a series of coal pockets in use on the New York, Lake Erie & Western Railroad, at Southport, N. Y., at Waverly, N. Y., at Hornellsville, N. Y., and at Susquehanna, Pa.

The coaling system known as the "Clifton" or the "Kerr" chutes, as used very extensively in the West, principally for

soft coal arriving at the coaling station in flat cars, was described and thoroughly illustrated in the issue of the *Railroad Gazette* of Dec. 18, 1891, in which the coal chute of Messrs. Williams, White & Co., of Moline, Ill., is described, which chute combines the characteristic features of the Clifton and Kerr chutes.

Collins' system for coaling locomotives, as in use on the Pennsylvania Railroad, was illustrated and described in the issue of the *Railroad Gazette* of June 16, 1882.

The extensive overhead coaling station of the Pennsylvania Railroad at Hackensack Meadows, Jersey City, N. J., was described and illustrated in the issue of the *Railroad Gazette* of Sept. 2, 1887.

The overhead coaling station of the Philadelphia, Wilmington & Baltimore Railroad, at Gray's Ferry, was described and illustrated in the issue of the *Railroad Gazette* of Dec. 9, 1881.

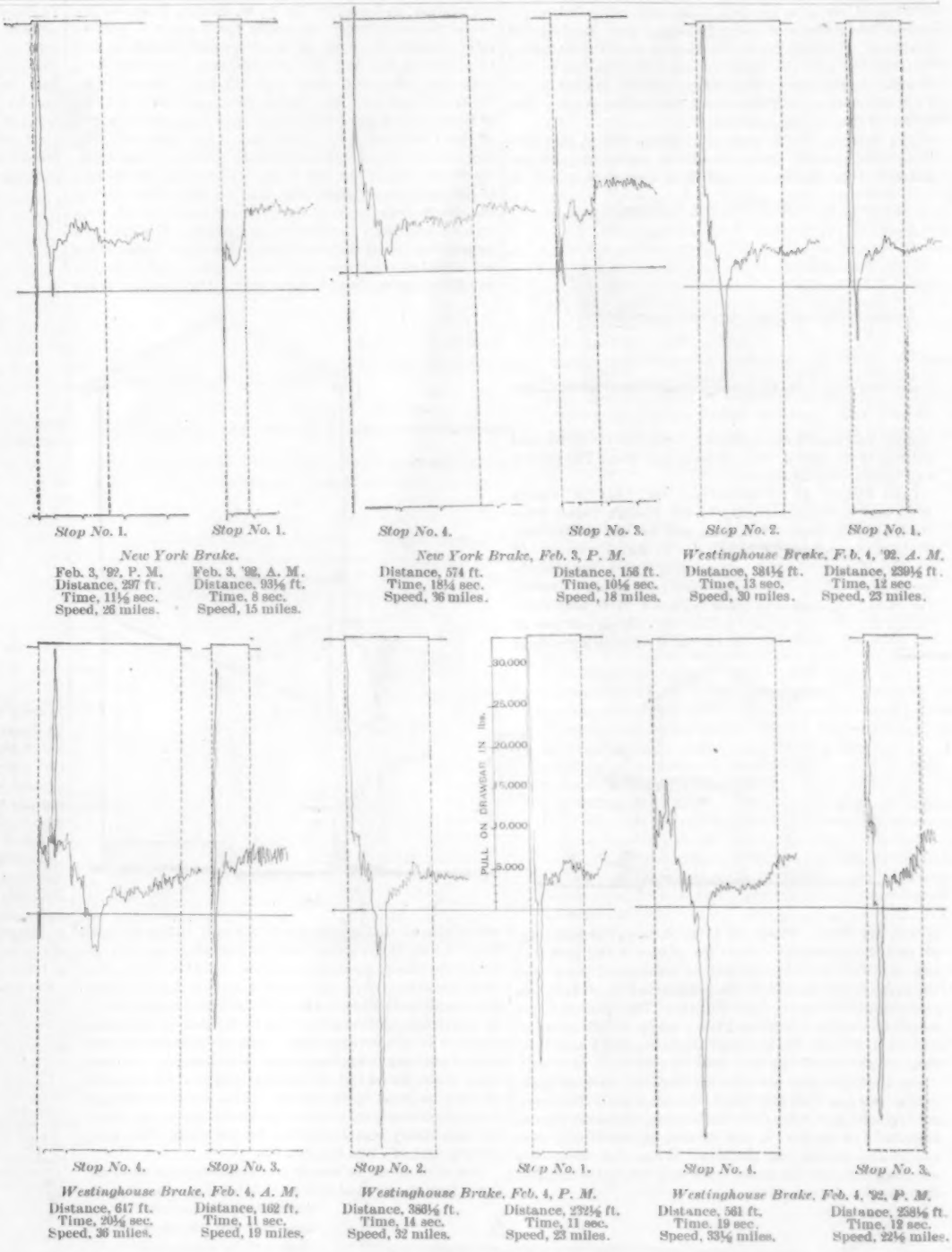
The overhead coaling station of the Chicago, Burlington & Quincy Railroad, at Aurora, Ill., with the novel feature of running the coal out on an overhead bridge by means of buckets suspended from an overhead rail was described and illustrated in the issue of the *Railway Review* of June 15, 1889.

Dynamometer Diagrams—Burlington Brake Trials.

The dynamometer diagrams accompanying this show the pull on the drawbar of the train between the dynamometer car and the locomotive tender during the various stops at the recent Burlington brake trial. The data under the diagrams give the particulars showing the speed at the time the stops were made and by referring to the *Railroad Gazette* of last week, the other data will be found relative to these same stops.

It will be noticed that there was a strong pull on the drawbar at the end of most of the stops. It is somewhat puzzling to give an indisputable explanation for this, but it seems evident that either the driver brakes or tender brakes leaked off, or they were inefficient for some cause during the latter part of the stops. This pull at the very low speeds was sufficient to break a link between the tender and the dynamometer car on one occasion, and it also undoubtedly had much to do with the breaking in two in other parts of the train on several occasions. Probably also the tension in the train due to this pull of the locomotive had a tendency to reduce the shocks at the rear of the train, as it stands to reason that the train could not be in compression and extension at the same time.

These diagrams will bear further study and will serve to show how the drawbar stresses vary during an emergency stop.



DYNAMOMETER DIAGRAMS—BURLINGTON BRAKE TRIALS, FEBRUARY, 1892.

The Warren Springer Boiler Explosion at Chicago.*

At 4:35 p. m., Jan. 8th last, one boiler out of a battery of nineteen, exploded at the manufacturing establishment of Mr. Warren Springer. It was my first impression after examining the boiler that the explosion was caused by low water, understanding low water to mean the failure to feed the boiler, thus gradually exposing the metal to overheating. But subsequent and more careful study has led me to a different conclusion.

The drawing represents the boiler as ruptured, replaced, however, in its proper position. It is a common type of boiler, 60 ins. in diameter, by 16 ft. in length, 60 tubes, 3½ ins. in diameter. It is made in six sheets, double riveted at the longitudinal seams, $\frac{5}{16}$ ins. thick iron, having the maker's brand of 50,000 lbs. tensile strength stamped upon the sheets. Dome, manholes, bracings, settings, trimmings, are all such as are of very common occurrence, and if not so good as the best practice of the day demands, yet good enough to be safe with good care. And if the best boiler does not get good care it is also unsafe.

The city's boiler inspector had made two recommendations which had not been complied with: namely, a pop safety valve should have been substituted for the lever safety valve; and a fusible plug should have been inserted somewhere. Experience has shown lever safety valves to be unreliable after years of use. The various fulcrums and bearings are liable to stick fast, and the valve itself, if not frequently opened, will rust or cement to its seat. Nor does it lift promptly or fully; in short, it is not a sensitive or a reliable mechanism. The pop safety valve has none of these objectionable features. The word pop describes the prompt action of the valve. For this explosion the safety valve was not responsible, because all the boilers had one common steam pipe connection and no excess of pressure in any one boiler was possible which a safety valve could relieve.

Fusible plugs are of two kinds, fire and steam plugs. Fire plugs are brass plugs screwed into some parts of the *fire* space (crown sheets of the locomotive type of boilers) with a central core of fusible metal melting at about 450 degrees. Steam plugs are inserted at the top of a pipe 24 in. above the boiler, and extending through the top of the boiler down to within 1½ in. of the top of the tubes. The fusible core melts at about 240 degrees, which corresponds to the temperature of steam at 10 lbs. pressure. The hot water is forced up into this tube, but the large exposure of the tube radiates the heat so rapidly as to leave it comparatively cool—when however, the water gets below the mouth of the tube the water falls out of it, and steam of higher temperature taking its place, melts the soft core of the plug. Neither of these fusible plugs is absolutely reliable. The fire plug can become coated over with a scale, thereby excluding the water from the low fusible metal, and which will, therefore, fuse and run out; but as the scale bridges over the small opening water will run out and give warning. The steam plug is liable to be coated over with slush and scum floating near the surface of the water, and thereby prevent the steam from getting freely to the low fusible metal in case of low water The steam plug is usually so made that it can be taken out and examined without shutting down, and it should be examined frequently or it may become unreliable.

There have been repeated attempts to make some sort of float give both a high and a low water alarm, and while the device is very simple in its inception, there are refined mechanical difficulties in the way. Electrical appliances have often been used, but they are now generally discarded. However, I believe there are now before the public high and low water alarms that are worthy of adoption. I do not mean that they are free from the possibility of failure to work—that cannot be said of any mechanism—but fully as reliable as fusible plugs. In the case in point three or more men swore that but a few minutes before the explosion there were 2½ gauges of water in the boiler. If these men tell the truth and the gauge glass and try cocks were all in good order, "low water" was not the cause of the explosion, and fusible plugs would have served no purpose—*unless* we believe in the "lifting" theory, which has been cited to be a correct one. If the water can "lift" itself away from the sides of the fire sheet and remain around the tubes, then a fire plug in the fire sheet would have given notice of the danger.

* Extracts from a paper read before the Illinois Chapter of the American Institute of Architects, Feb. 15, 1892, by A. F. Nagle, Consulting Steam Engineer, Chicago.

This "lifting" theory does not necessitate that the water should leave the boiler through the steam pipe to go either to the engine or over into one or more boilers. There are about 11,000 lbs. of water in the boiler, and if that had gone to the engines it would certainly have been known. If it had gone into its companion boiler it would have flooded it. I think that by the "lifting" of the water is meant that it pulls itself away from the fire sheet sufficiently far to expose the sheet to being burned and yet remain around the tubes and not go up into the steam pipe.

Your attention is called to the position of the glass water gauge and the evidence that no change of water line was reported. The lower connection was made in the head and close to the side of the boiler and just above the top of the tubes. If the water had left the entire side of the sheet it would also have left the glass, and if the water level had been raised it would also have shown in the glass, but apparently neither of these actions took place.

This theory has been advanced in explanation of the cause of the explosion by all of the employés who had a theory at all, by several experienced and reputable master boiler makers, by several machinery agents dealing in boilers, by one or more present and past city boiler inspectors, and by the experienced Vice-President of the Hartford Boiler Insurance and Inspection Company, who have to meet the financial loss.

Against this "lifting" theory were several experienced and reputable master boiler makers, a number of the Examining Board of Engineers, and a few other parties, all of whom believed the explosion was caused by "low water."

Only one witness, the U. S. Government Inspector of Marine Boilers, testified that low water did not cause the explosion, but that the iron was of a poor quality, deficient in ductility and intensile strength, and that 75 per cent. of the boilers in the city were made of like material. The brand of iron called for 50,000 lbs. tensile strength. This inspector is reported to have tested three pieces and found them to vary from 43,000 to 51,000 lbs. per sq. in. As the normal strain produced by 80 lbs. steam pressure is only 8,600 lbs., it could not be poor iron alone that caused the explosion.

Before the Explosion.—There was nothing especially unusual in the condition or operation of the boiler before the explosion. Aside from what I have already explained as to the safety valve and fusible plug, it appears that the city boiler inspector had ordered a patch to be put on over a bulge at the rear end and bottom of the boiler, not much larger than one's hand. (See the illustration.) I have been informed that this is the only blister or bulge that was not attended to. There had been a more serious bulge some two or three years ago on the middle sheet, but that was patched. (See the illustration.) Some trivial leaks have been testified to, but the boilers had been inspected but a few weeks before by the Hartford Co., and a policy of $50,000 written on them.

In the afternoon at 4:30, 19 boilers were working at the rate of about 1,600 H. P. or about 70 H. P. each (there were other boilers of larger size). At this time steam *may* have been let on to the Electric Light Co.'s plant, utilizing at this point about 300 H. P. or increasing the power of this boiler from 70 H. P. to 85 H. P. This is about the commercial rating of the boilers. I say *may* have been let on, but it is not at all certain that it was then turned on. It may have been open all day, or turned on any time of the day. It is a mere conjecture when it was turned on. It is said that no effect upon the steam pressure is observed when it is turned on, and there is no reason why it should affect it more than a few pounds.

After the Explosion.—The appearance of the boiler after the explosion was as follows: Twelve inches below the right hand side of the horizontal seam of the first, or fire sheet, the sheet was torn open the entire length in very nearly a straight, horizontal line. Then vertically it followed down the row of rivets on the front head more than half way round the head. On the seam with the middle sheet it followed also down the rivets to the centre or bottom, where a patch had been put on and then cut into the patch on the middle sheet diagonally about 9 in. deep, and then around it again until it ended 16 in. above the horizontal seam on the other side. The line where the rupture evidently began was at the upper side 12 in. from the seam. It was much buckled by heat in both vertical and horizontal directions, and it was so unmistakably a sign of overheating that no one attempted to deny it. "Low water" would be the natural expression at the sight of it, and to strengthen that belief there was a distinct "low water line" just below the lower line of tubes, as indicated by the discoloration of the metal, so that it was almost conclusive that water had stood at this line, about 10 or 12 in. deep on the bottom, when the explosion occurred. These signs are indisputable, but the conclusions as to the manner in which this was brought about, I believe, are wrong. The tubes were not disturbed in their position, and it is said they show no signs of having been overheated.

The "Lifting" Theory.—It is said in explanation of the "lifting" theory that the sudden opening of the steam valve into the electric light plant caused a sudden rush of steam, and that the heavy firing drove the water away from the sides of the sheet. Now there are few boilers that are not worked under much severer conditions daily. To increase, however, suddenly such boilers from 70 to 85 H. P. is not a great strain. I venture to say that in our cable and electric railway machinery the boilers are called upon for several hundred per cent. of increased power within a few seconds.

Superheating of Water.—I may explain, however, that there is danger in the sudden opening of steam valves. When all circulation of water within a boiler has ceased, there is a possibility of producing an explosion by opening a large steam valve. When a locomotive or marine engine comes to a stop, cautious and intelligent engineers either open the safety valve or blow-off valve, or start the feed pump. This is done to keep the water in circulation. It would be well for stationary engineers and firemen to understand the necessity for this practice. The reason for this precaution is that water will heat up to a little higher temperature before making steam, if kept perfectly still, than it will after it is once in motion. If kept perfectly still it may be heated several degrees hotter without the pressure increasing correspondingly. Water free from air, and distilled water, is more easily put in this condition. Scientific men in laboratory work have been able to heat water 20 to 25 degrees above its normal temperature. The instant this quietness of the water is disturbed, as it will be by the sudden opening of a valve, the water starts instantly into circulation and sets free this excess of heat above its normal temperature, which in the case assumed is sufficient to increase the steam pressure to nearly 300 lbs. per sq. in. But in this case the water was in active circulation and no such action could have occurred. Without the highly heated water no very disastrous explosion could have occurred. Mere steam, without the presence of water, is only as explosive as hot compressed air.

High Water and Sudden Release.—To suddenly open a 6-in. valve, with scarcely any steam space with which to supply the engine, is practically taking all the pressure off the water—it is equivalent to the rupturing of a boiler which always occurs just previous to what is the main destructive part of an explosion.

It is true that high water and the sudden opening of a large valve can produce an explosion. But high water has not been claimed to exist in the Springer case.

Driving the Fires.—As to the intensity of the firing it was by no means an exceptionally rapid rate. Double that rate can be produced by a good high chimney, and by a forced draft, such as prevails in locomotives and marine boilers, fires are frequently driven ten times as rapidly, and we never hear of the water leaving the metal surfaces on that account. The average evaporation of these boilers calls for only $\frac{1}{10}$ of an in. of thickness of water to be converted into steam every minute. Experiments have been made to determine the relative value of heating surface in different parts of boilers, and it is believed that about one-half of all the water evaporated in these tubular boilers is evaporated over the fire sheets. That would make the evaporation about 20 times as great over the fire sheet as the average rate, or say $\frac{1}{2}$ of an in. in thickness per minute, and on locomotives ten times as great, or $1\frac{1}{2}$ in. In this exploded boiler, the sides being curved and nearly vertical in position, they are really a better form to resist the lifting action than the nearly horizontal surface of locomotive crown sheets. I am sure that rapid firing could not have caused the water to leave the sides in the case in point.

After reviewing all that has been said on this "lifting" theory I cannot do otherwise than to reject it as unsound in principle and unsubstantiated by facts.

Low Water Theory.—I conclude that low water was not the cause of the explosion and for this reason: if the water were in the middle of the glass and the feed shut off entirely, it would have taken 1 hour and 45 minutes to have evaporated the water down to the top of the tubes. To have continued this evaporation at the same rate, it would have taken three hours more, to have brought it down to the bottom of the tubes, and where there was found a water line on the exploded boiler. It is not difficult to calculate the time required to heat such a sheet red hot if there is no water in contact with it. It would take from two to four minutes. It would take from 20 to 30 minutes to heat the tubes red hot. Now, I do not believe that it is possible for the sheets, or the tubes above this apparent low water line, to have been exposed for three hours to the heat of the fire and not give out long before that time had passed. It is not reasonable to suppose that the generated steam passing over the surface of the hot sheet can keep it sufficiently cold to prevent loss of strength for fully three hours. Any one familiar with the slowness with which steam takes up heat, or becomes superheated, will agree with me that it was not possible for the explosion to have been delayed so long after the water began to fall below the top of the tubes.

Deductions.—The "low water" theory produced by neglect to feed the boilers with water I reject for the reasons given. Yet low water can be produced in another way, and one which is far more likely to accord with the facts mentioned, that is, by "blowing-down." It is customary to blow out an uncertain amount of water at regular intervals to get rid of scum, sediment, etc. It is done from one to four times a day, once a week, or not at all—depending upon the character of the water. I am not informed as to the practice at the plant in question, but I wish to call your attention to the short time required to blow all the water out of the boiler—there is a 2-in. blow-off valve, and it would take only from 2 to 4 minutes if wide open. Either by neglect or stupidity, this blow-off valve could bring the water down to the apparent low-water line seen, in a few minutes, and we have also seen that it requires but a few minutes to heat the iron red hot. One witness said that he went into the boiler room one morning and found the fires lighted, but no water in the boiler; that he hurriedly sought the leading fireman and found him putting on the feed pump. When informed of the discovery they quickly hauled the fires. Perhaps several such occurrences might have injured and distorted the iron to such a degree that it was liable to give way at any time. But the low water line, just below the tubes, is very distinctly marked by the discoloration of the metal. If this had been produced some time before the explosion this line would have been less marked, if not entirely removed, by the action of the furnace gases.

Summary.—The following conclusions seem to be justifiable:

1st. That there may have been water in the glass two or three minutes before the explosion.

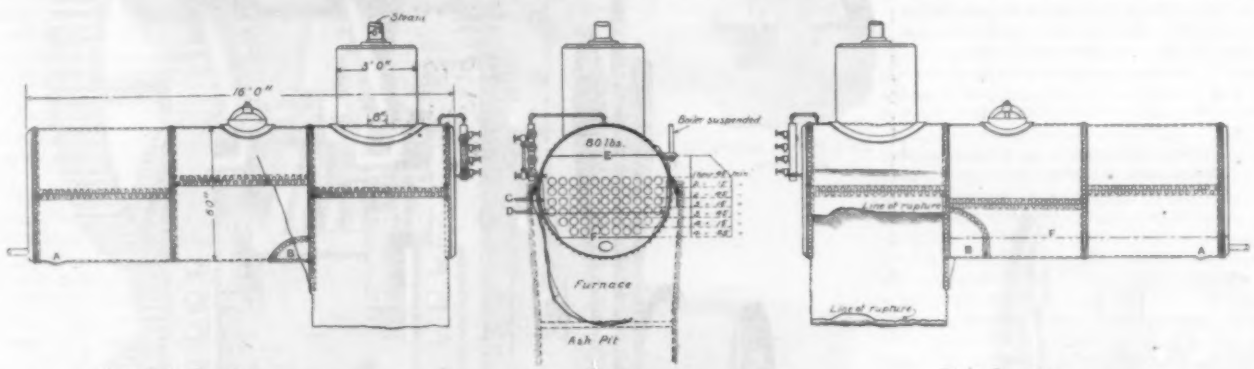
2d. That "low water," produced by neglect to feed the boilers, was not the cause of the explosion.

3d. That "low water" produced by "blowing-down" was probably the true cause of the explosion.

4th. That high water was not the cause of the explosion.

5th. That the "lifting" theory is not a tenable one.

6th. That the quality of the iron, though not of the best, was not so bad as to be accountable for the explosion.



Left Side Elevation. Front. Right Elevation.

A A. Bulge where inspector recommended a patch put on. It is not a blister.
B B. Patch put on May, 1888, ⅝-in. iron.
C D. Position the water must have taken to justify the lifting theory.
E. Reported water line, one minute before explosion.
F F. Apparent low water line.
Table on right of front view shows time required to evaporate down to different levels if no water were fed in the meantime, estimated on the basis of boiler working at the rate of 70 H. P.

EXPLODED BOILER—WARREN SPRINGER FACTORY, CHICAGO, JAN. 8, 1892.
Sketched by A. F. NAGLE, *C. E.*

7th. If the explosion was caused by "low water" produced by the slow process of evaporation or failure to feed, then either one of the two kinds of fusible plugs would have averted the explosion, but

8th. If "low water" was produced by the rapid process of "blowing down," while either fusible plug would have given notice, it would have been too late to have averted the explosion.

Toggle Drawing Presses.

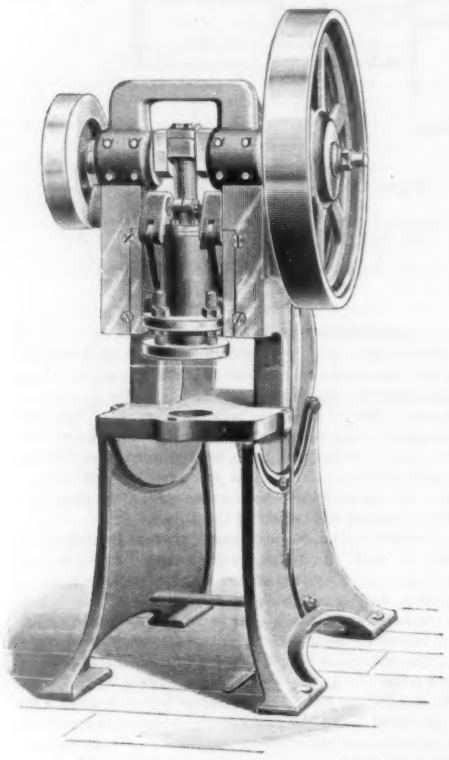
We give herewith illustrations of the smallest and of one of the larger drawing presses now being manufactured by the E. W. Bliss Co., of Brooklyn, N. Y. Each shows similar marked improvements over those of a few years back. The toggle operation is the leading feature of the improvements, bringing the presses to the highest state of perfection in strength and capacity as well as efficiency, the latest and most important change is the arrangement of the toggles to operate the blank holder dispensing with the last of the cam motions.

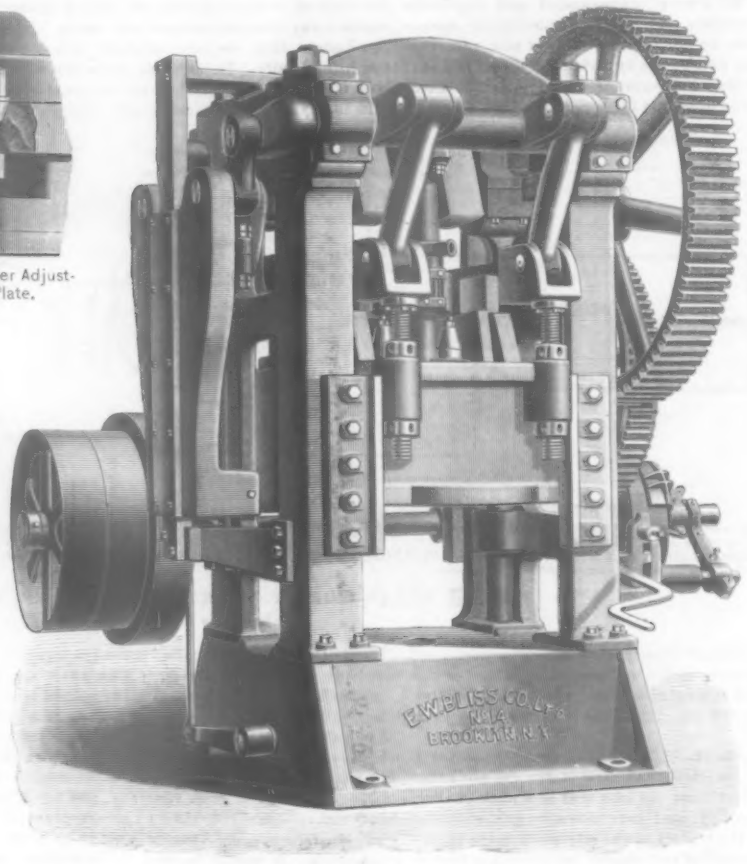
In the larger machines a pair of rock shafts is set at the back and front of the upper framing, and to these the blank-holder yokes are connected by toggle links. The rock shafts are operated from a crank on the outer end of the main shaft by a pair of links, and the whole imparts a more uniform pressure to the blank than by the use of cams. The strains of operation pass to the main shaft indirectly through the toggles, and the thrust of drawing comes directly upon the frame work, relieving the bearings from the old style strains and friction.

The main frame of the smaller sizes is of a single casting, the main shaft carrying the plunger is of forged steel. The plunger is guided on the inside of the blank holder slide.

The adjustment of the blank holders is accomplished by means of four steel screws, as shown in the small detail illustration. There is no necessity for "packing" the dies. A blank-holder plate *E*, is held in place by three or four large screw-bolts, each of which, as shown, can be adjusted separately, without any cramping of the movement of the slide in its guides. Conical split nuts *C*, adjust themselves to any angularity of the screwbolts found necessary to the production of an even pressure all round.

Blank-Holder Adjusting Plate.


Toggle Double Action Press No 182.



Toggle Drawing Press No. 14.

The punch portion of the press is readily adjusted by means of a heavy screw on the inner slide. This screw cannot get loose or turn out of place. Through the toggle motion a more perfect "dwell" of the blank holder is attained than with the cam. All the press movements are under perfect control through a single hand lever used for actuating a powerful friction clutch and brake. The slides can be stopped or started instantly, or held at any point of the stroke.

Car Roofs.

We published last week an abstract of the paper on car roofing read before the Northwestern Railroad Club by F. S. Woods, of C. B. Hutchinson & Sons. At the same meeting papers were read by J. P. Elmer, of Drake & Weir, J. B. Quigley, of the Freight Car Equipment Co., and M. A. Garrett, of F. W. Bird & Sons, extracts from which are given below.

BY J. P. ELMER.

In order to overcome the objection of racking, the roofing material proper should have, and be able to maintain under all conditions, the quality of elasticity. To stand the weather it should not only have the quality of elasticity, but should be able to withstand the effect of moisture, heat and cold, and the action of acids, such as are generated by the action of climate upon the various kinds of material entering into the construction of roofs.

Of all known substances that have been used in the construction of car roofs up to the present day no material will probably stand the test and retain all the necessary qualities as well as asphaltum, which is exclusively used by the Drake & Weirs company in their asphalt car roofs, which to most of you are not new, there being many in use at the present time. The peculiarities of asphaltum are that water, heat or cold do not affect it. Under their action it does not become hard or brittle, but constantly retains its elasticity. We ask that you will not confound asphaltum with coal tar, and other artificial pitches, which are generated by the use of heat. There are no like qualities in them. Coal tar upon exposure to heat or cold becomes brittle and easily breaks; having by exposure lost its elasticity. Our roofing material is composed of a heavy felt, thoroughly saturated with a pure Trinidad asphaltum. The first of these roofs was applied in November, 1879, and the material is as good to-day as when applied 12 years ago.

We call attention to a point too frequently overlooked, viz., that a roof covered with felt saturated with asphaltum is a fair non-conductor of heat, and a car so built will be cooler in hot weather than with other constructions. Especially is this true regarding refrigerator cars. Experiment has proved that the difference in temperature in a refrigerator car with an iron roof, and a like car with asphaltum roof and air space, is from 10 to 12 degrees.

BY M. A. GARRETT.

The serious question is substitutes to adopt in departing from what is conceded as the original type of roof, viz., the double board. In the early day of car construction, when primeval forests yielded the first class qualities of lumber at nominal cost, the board roof was the only one thought of for car covering, but since all that is now changed other expedients have been and are now being tried.

One unalterable liability has always been present with the board roof, the speedy liability to water soak and rot, not only of the roof boards, but of side plates, carlines, etc. Everyone with an extended observation and experience will admit that in a comparatively short time after the car has gone into service, the wearing and racking induced by heavy loads, etc, produce a break in the joints even when boards are well laid in paint, which will admit water freely, and because the boards are so tightly nailed together, will prevent its prompt evaporation or drying out, and this soon produces mildew and rot. It was therefore an easy step for some, from wooden to metal roofs, which are not fulfilling reasonable expectations considering their cost.

We next come to fabric roofs. It must be admitted, that, like the metal roof, the early forms of the fabric roof have brought disappointment, not so great, indeed, as the metal, because of low first cost of the fabric, but still sufficient to cause thoughtful men to be more or less skeptical. This skepticism has arisen entirely from the nature of the fabric most extensively used not only as to their texture, but also as to the water-proofing agents used. Some of the most prominent fabric roofs have been and are made of what is known as "felt" or "building felt." This is a kind of felt, although of very low grade, and without tensile strength. These felts are made the retainers of coal tar, pine tar and other water-proofing agents, and when used, as originally intended, on buildings where stated examinations and easy repairs can be made they are successful. But when applied to cars they are not successful, because coal tar, pine tar and some forms of so called asphaltum quickly yield to the action of sun heat, and so oxidize and leave the fabric lifeless, brittle and subject to speedy disintegration; for it should be borne in mind that the felts saturated as indicated above have no "life" beyond that imparted by the waterproofing agents.

Again, the texture of a fabric must be of sufficient tensile strength. Felts of any kind are never strong in this respect. Any fabric that is laminated or made in layers is manifestly much stronger than a felt, and the successful car roofing fabric must be made in layers to obtain greatest strength. The veneered coach ceiling is more serviceable than the same thickness of wood would be. This same principle must be used in a strong fabric roof. Again one of the chief drawbacks to a fabric roof has been, that from the very nature of its application, it was and is necessary to drive nails through on the flat or water line. Obviously such construction is faulty. How can a fabric be water tight with a great number of holes driven through it on the flat? A roof applied thus, on a car 34 ft. long, with two intermediate purlines will have nearly 1,000 holes through the fabric. A successful fabric roof must therefore have its nailholes raised above the water line. Another desirable feature in car roofing of any kind is an air space. I am unable to touch some of the features of our roofs because it would make this paper too long, but from extended conversations with many in charge of equipment in all parts of the country, I am convinced that the coming type of roof is a fabric air space roof with the features of strength of fabric, exemption from loss of "life" by sun-heat, and therefore without tendency to disintegration and exemption from leak and nailholes because of their being above water line, and cheapness of first cost.

BY J. B. QUIGLEY.

The top iron roof is the proper plan, and by far superior to any other, providing good galvanized iron is used, and it is fastened securely to the frame of the car, not to the roof boards, as is usually the case. To overcome the defects that are shown in the various plans of car roofing, the steel cable car roof has been brought out, a description of which is as follows:

The roof is made of No. 22 steel plates, well galvanized. They are corrugated at the edges. The plates lap each other at their edges, and are securely held in place by galvanized steel wire cables, the ends of which are fastened inside the car to the carlines, or the plates, as preferred. In this plan of construction, the roofing boards are laid lengthwise of the car and across the carlines, the strongest possible way of securing the boards and strengthening the top of the car against the cross strain they are subject to.—The steel plates being made of No. 22 gauge in thickness, anyone acquainted with the nature of steel of this thickness, galvanized, will concede at once that it will be impossible to construct a car that will last as long as these plates. Taking these solid steel plates and fasting them to the frame-work of the car without nails, screws, rivets or bolts, not making as much as a pin hole in the entire surface of the roof, how is it possible for the roofs to leak or give out in any way short of a total wreck of the car?

For construction and repairs it is unequaled for simplicity. In case of an accident you can get at the roof both from the inside and the outside of the cars. Should a plate or a portion of it require renewal all that is necessary is to slacken up the cables and insert a whole plate or a portion of one, as the case requires. The cable fastenings can be overhauled either from the top or inside of the car. In short, there is nothing covered up, all the parts are accessible, both from the inside and the outside. This roofing will last as long as the car it covers, and this without any additional cost or expense after it is applied. Its positive security to both the car and its contents is beyond question.

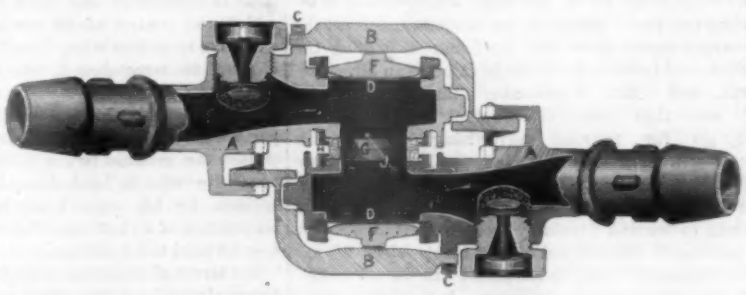
The Niagara Falls Tunnel.

There are now engaged at work in the Niagara Falls tunnel 400 men, while on the surface 100 more workmen are employed. Work goes on continuously, the men working in 12-hour shifts.

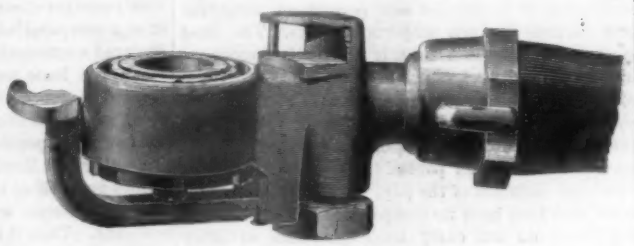
A New Steam Heating Coupler.

The ingenious and industrious Mr. Gold has brought out a new coupler for steam heated trains which is called the "compression" coupling. It is shown in the illustrations. It is said to be the only steam coupling that tightens by compression. It is on the Westinghouse type, and as an air brake coupling it will connect with the Westinghouse air brake coupling; as a steam coupling it will connect with the Gibbs steam coupling.

The composition seats, *G*, are mounted unyieldingly in the head of each coupling, being held to position by the thimbles, *H*. In order to use the internal pressure of steam to force the seats together, there is a distinct diaphragm *D*, without holes or corrugation of any sort, on the opposite or outer side of each coupling head, so situated that the internal pressure thrusts the diaphragm outwardly. The diaphragms are kept in place by the thimbles, *E*. To utilize this internal pressure to bring the seats together, there is a lever or movable arm, *B*, made as a separate piece, cast so that one end of arm is the lug or tooth which engages with the opposite coupler body, and the other end enters the recess, *C*, cast on the coupling head, and is held to place by a set screw. This lever arm is cast with an oblong slot, which engages with a circular pin cast on coupler head. By this construction, as the internal pressure of steam is exerted on the diaphragms from the inside, the seats are drawn more tightly together.



Sectional View of "Compression" Coupling.



One Body of "Compression" Coupling.

It will be observed that the passage for steam in this coupling is very large, which is an important point. The coupling heads are cast with nipple ends to receive the hose. The gravity relief trap may be used or not as desired. This coupling uncouples automatically when the cars pull apart and without injury.

The Gold company offers this coupler for air brake hose, also, slightly modified to couple with the Westinghouse.

A Laboratory Locomotive.

Reference has already been made in these columns to the proposed addition of a locomotive to the equipment of the mechanical engineering laboratory of the Purdue University at Lafayette, Ind. This locomotive, which is a standard Schenectady American type engine complete in all respects, has now been put in place in one corner of the labaratory and adjusted for testing purposes.

The truck wheels rest on a short section of track, while the driving wheels are supported by a similar set of flangeless wheels which are placed directly below the drivers. The axles of these lower wheels are extended at one end and connected to two friction brakes, on the principle of the Alden absorption dynamometer, by means of which the load can be varied and accurately adjusted. These dynamometers are used simply as brakes to supply the desired resistance. In order to measure the tractive power, the draw-bar of the locomotive is connected to a specially designed dynamometer by which the actual traction can be as readily weighed as the load on an ordinary testing machine or in fact on any scales. Revolution counters are connected to the driving wheels and to the bearing wheels, and an index is fitted for showing the longitudinal motion and magnifying it, as the actual travel is only about one-tenth of an inch.

The installation of this engine is of special interest, as we believe it is the first which has been connected up in a laboratory in this country wholly for testing purposes, and results of tests will be looked for with much interest. Many factors in locomotive economy which can never be satisfactorily established by tests on the road can here be accurately determined, as, for example, the actual steam consumption at different speeds and cutoffs, the economy of various degrees of compression, the size and position of exhaust nozzles, etc.

As we have said, this locomotive is simply a modern road engine, complete in all respects, and its range of adjustability is therefore limited. It is to be hoped that when the professors and students at Purdue University have tested it thoroughly they will be able to make it still further adjustable, as, for instance, by inserting counterbalances which can be changed in weight and position, and substituting compound cylinders, and thus extend the range of their tests. In the meantime there is much which can be definitely established by means of this locomotive

We may add that any one who takes time to visit the laboratory at La Fayette will be amply repaid for his time and trouble.

The Bridges and Tunnels at New York.

The following is a list of the schemes now being promoted for bridging or tunneling under the waters of New York Harbor.

By the Hudson Tunnel Railway Co.—Tunnel under the Hudson River from Hoboken to New York.

By the New York & Long Island R. R. Co.—Tunnel under the East River from Forty-second street, New York, to Long Island City.

By Messrs. Corbin and Wiman.—Tunnel under the Narrows from Staten Island to Long Island.

By the Manhattan & Long Island Bridge Co.—Bridge over the Harlem Kills from Randall's Island to Morrisana; bridge over the Harlem River from 125th street, New York, to Randall's Island; bridge over Little Hell Gate from Ward's Island to Randall's Island; bridge over the Harlem River from 106th street, New York, to Ward's Island; bridge over the East River at Hell Gate from Astoria to Ward's Island; bridge over the East River from Brooklyn to New York, crossing Blackwell's Island.

By the New York & Long Island Bridge Co.—Bridge over the East River from Brooklyn to New York, crossing Blackwell's Island. (This bill passed the New York Assembly Feb. 17.)

By the East River Bridge Co.—Bridge over the East River from Broadway, Brooklyn, to between Delancey and Rivington streets, New York; bridge over the East River from between Little and Bridge streets, Brooklyn, to between Delancy and Rivington streets, New York. (This bill passed the New York Assembly Feb. 16.)

By the New York & New Jersey Bridge Co.—Bridge over the Hudson River from Jersey City to New York.

By the North River Bridge Co.—Bridge over the Hudson River from Twelfth street, Hoboken, to Sixth avenue, between Twenty-fifth and Twenty-eighth streets, New York.

Owing to a mistake in the bill as it was referred to the committee the terminals of the Blackwell's Island Bridge of the Manhattan & Long Island Bridge Co. were placed in our last issue between Forty-first street and Ninty-second street in New York, and Fifth street and Flushing Avenue in Long Island City, the latter being a distance of only six or seven blocks, and not at all corresponding to the location on the New York shore. This discrepancy will be removed before the bill leaves the committee by changing the Long Island City terminus to correspond with the one opposite on the New York side. As it now stands the whole water front between Fifth street and Flushing avenue is already occupied by the terminals of the Long Island Railroad, and there is a natural objection to any encroachment thereon. It is expected, however, that all opposition of the railroad company will be withdrawn when the bill is amended.

Scotch Pig Iron.

A long article in the *Iron and Steel Trades Journal* calls attention to the fact that the production of this famous iron is decreasing. In the 21 years 1860-1880 there were only six in which the production was less than one million tons, but there were six years in the decade ending with 1891 in which the production was less than one million tons, and since 1885 it has been less for every year but 1888. During the 31 years under consideration the consumption of Scotch pig in Scotland increased in an irregular manner until last year, when, on account of a blast furnacemen's strike, it fell to nearly one-half, and at the same time the purchases of English iron, mostly Cleveland, increased by about 80 per cent. The exports of Scotch pig, including the takings of England, increased from an average of rather less than 600,000 for 1860-63 to their maximum, 915,000 tons in 1872, and since 1885 they have not been equal to 500,000 tons any year and fell to 313,000 tons for 1891.

The yearly average of Scotch G. M. B. warrants from 1860 to 1871, inclusive, varied between 49 and 60 shillings, but in 1872 the average price was 102, and in 1873 it rose to the average of 117 shillings, with a maximum of 145s. 7d., or $35.52. Since 1873 the tendency of prices has been downward, and from 1878 the price has been above 50 shillings only one year, 1880, and for both 1886 and 1888 the average price was less than 40 shillings, but for 1890 the average price was 49s. 6d. For 1891 the price, which has been in the hands of the London syndicate, has been 47s. 2d.

In the meantime Scotch pig, which was thought necessary for mixing with American iron for casting, has been quietly replaced by Ohio softeners and other pig irons produced in this country; their use extending into Canada, and wherever our mixing irons have obtained a foothold they seem to have retained it. The Germans also are substituting irons of their own make for softeners, with increasing success, and it seems impossible that Scotch pig should ever again hold the commanding position it occupied for so many years.

Specifications for Steel Plates for Locomotive Boilers.

The following is a summary of the most important requirements contained in the very complete specifications for boiler steel issued by the Eastern Railroad of France, which were published in the *Bulletin* de la Commission Internationale du Congrès des Chemins de fer (Vol. V., Nos. 7, 8, 9):

Two grades of steel plates are used: (A) for cylinder shells and analogous work; (B) for fireboxes, flanged parts and special uses. Bessemer steel is excluded. In the manufacture of steel plates no iron or steel which is derived from phosphorus ores is to be used. The welding of parts of ingots together to form a plate is forbidden. All plates must be thoroughly annealed and carefully trimmed to dimensions. No undersized plates will be accepted, and the limit for excess is limited to 0.39 in. (1 cm.) in any direction for plates less than 0.47 in. thick, and 0.787 in. for plates 0.47 in. or more in thickness. Plates exceeding these limits may be accepted but the excess weight will not be paid for.

The limits for thickness are placed, for plates from 0.315 to 0.787 in. thick, at 5 per cent. in excess, and 2.5 per cent. below the specified thickness. Uniformity in thickness will be determined by calculating the weight.

Tensile Tests.—A test piece will be cut from each plate. For (A) plates the breaking strength of the test pieces cut from cold annealed plates must be from 40 to 50 kilog. per sq. mm. (56,770 to 63,850 lbs. per square inch) for individual test pieces, with a maximum mean of 42 kilog. (59,600 lbs.) For (B) plates the limits are 36 to 40 kilog. (51,000 to 56,770 lbs. per square inch) with a maximum mean of 38 kilog. (53,900 lbs.). The elongation after rupture must be at least 26 per cent. for (A) plates 0.787 in. thick or under; 27 per cent. for (A) plates over 0.787 in. thick, and 28 per cent. for (B) plates. A *minimum total* is obtained by adding the maximum mean tensile strength to the minimum elongation, giving 68, 69 and 66 for the three cases. A test piece from each plate is to be heated to a cherry red (1,650° F.) quenched in water not above 68 deg. F., and must then show an ultimate elongation of not less than 12 per cent. in a length of 7.87 in.

Bending Tests.—After heating and quenching as already described, two pieces from each plate are to be bent cold until the faces are in contact throughout their length. The bending tests at a cherry red heat are: (1) one plate in 25 is to be tested by doubling the test piece until the sides are solidly in contact and then straightening the piece; (2) one plate in 50 is to be tested by doubling the test piece as before and then re doubling at right angles to the first bend. These tests are to be accomplished without developing cracks or flaws of any sort.

Punching Tests.—The test pieces will have a width of 2.75 ins. and a length sufficient to permit the punching, cold, of three holes 0.63 in. in diameter and 2.68 ins. from centre to centre. These holes will be enlarged, cold, by driving in mandrels having a taper of 0.1 in. in diameter per inch of length until the holes are enlarged to the following diameters: (A) plates, 1.5 ins.; (B) plates, 1.57 ins.

Test pieces similar to the above will be punched, heated and quenched as in other tests and will then have the holes enlarged to the following diameters: (A) plates, 1.38 ins.; (B) plates, 1.5 ins. These punching tests are to be made on one plate in 25 and without developing defects of any description. All of the foregoing tests may be made on pieces cut either in the direction of rolling or transversely.

Passes.

It is reported that the Ohio legislators are complaining that the railroads have shut off their passes. One senator is quoted as saying, "The railroads have declared a boycott on us and I guess we can play at the same game." Another talks thus; "The roads will yet sue for peace, as some bills will be presented and passed which will tear them wide open."

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in his journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The attempt to introduce on a commercial scale a tie-plate of rolled steel or iron is of quite recent origin. Heavy cast iron plates and chairs have long been used more or less and light rolled plates, of channel or flat section have been used in this country, in rather small lots, and quite experimentally for ten years or more. But it was not until about 1888 that a serious effort was made to introduce such a tie plate on a large scale and by the modern business methods of advertising and skillful sales agents. This effort has been steadily followed up; money, energy and brains have been spent in the commercial development of the idea, and to-day rolled steel tie plates are in use on hundreds of miles of track in all parts of the United States. The result of this large use and of careful study by many minds has been to find defects that had not been expected, and uses for which the tie plate was not originally intended. Old devices have been improved and new ones proposed. Both manufacturers and users have been educated rapidly. In 1888 it was granted that a tie plate would probably increase the life of a tie, although this was sometimes disputed; but it was feared by a great many good reasoners and open-minded men that it would shorten the life of the spike by diminishing the resistance to movement of the rail on its seat; that it would shorten the life of the rail by increasing the resistance to the blows of the wheels; and that it would be intolerably noisy. All of these objections have practically disappeared with experience. It is believed now by those best informed that the life of rails, spikes and ties is prolonged by the use of tie plates; and that, indirectly, rolling stock too gains by the smoother track. Strange to say, instead of plates making it harder to keep track to gauge on curves, as many predicted would be the case, they seem in several instances to have been more efficient for that special purpose than rail braces. These matters are treated in considerable detail on another page. We assume no responsibility for the writer's statements, but have no reason to doubt them and much reason to believe them. We have long held the opinion, and often expressed it, that the use of tie plates will be found to be one of the important elements of railroad economy; and that they, together with improved fastenings, heavy rails and, perhaps, treated ties, will make up the next great step toward smoother, more durable and safer track.

The Postmaster General's announcement, made some months ago, that he should decline to pay extra compensation for extra speed of mail trains has been carried into effect, formal notice that these payments will be stopped June 30 next having been sent to the various roads running special fast trains. Some of the newspapers have taken up the subject with considerable vigor, especially those interested in the West India Fast Mail between Jersey City and Tampa, Fla., via the Pennsylvania and Atlantic coast lines, for the withdrawal of this train would mean practically the loss of a whole day or more in the time of transit between northern and southern cities. We have seen no special reference to the trains between New York and the West, and in fact the Pennsylvania has just put on additional fast runs. This fact, with the talk about a train over the New York Central much faster than those now run, which was recently reported, indicates that very likely there have been negotiations between the Government and the railroads which might explain the apparently arbitrary action of the former. It is doubtless true that some of the roads get quite liberal pay for the mails they carry, taking slow and fast runs together, and the commercial instincts of the Postmaster General very likely may lead him to take what seems to be the most effective way of reducing this pay. Moreover, the announcements of the passenger agents show that the honor of hauling the fastest mail trains is not without value as an advertisement, and Mr. Wanamaker may be trusted to see that the Government money does not go for railroad advertising without his knowing it. The mail trains between Boston and New York, New York and Chicago, and a few other runs, are now and for several years have been, heavy enough to demand a train by themselves, independent of passengers (though not always independent of express companies' cars), so that there can be no reduction in train service in any event. It is solely a question of speed, and it may well be that the Government officials are depending upon the rivalries of different roads and the taunts of the newspapers toward those which are slow, to prevent any permanent lengthening of the time between important cities. The most important desideratum in this matter is a more rational method of reckoning the compensation. Many roads are receiving, in the aggregate, a sum which they deem satisfactory, but the different parts of the service are not paid for on equitable bases, so that the suspension of a certain part of the work may result in an unequal variation of the pay. The roads in the Atlantic Coast Line have no competitor in this particular thing; they do not carry large quantities of other mail, on which they can make up for a loss on a fast train, and it is therefore easy to understand that they might be the worst sufferers if the roads were all compelled to accept smaller pay.

The Reading Leases.

The announcement last week that the Philadelphia & Reading had leased two of its principal competitors in the business of mining, carrying and marketing anthracite coal made a very strong impression on the public. There can be no doubt about that, because the prices of the securities of the companies chiefly interested in this traffic advanced within a very few days after the announcement of the leases by the aggregate amount of about $38,000,000, which is more than the whole amount of their dividends for the past five years. During the present week, it is true, the prices of most of the coal securities have fallen a little from the highest quotations of last week, but the advance since the beginning of last week remains very great, and at the beginning of last week the coal stocks were already much higher than the lowest prices of this year, which were generally on Jan. 19. Since the latter date the advance in anthracite coal securities has been very nearly $50,000,000. The enormous sales of such securities on the stock exchanges (those of the Reading shares alone in New York and Philadelphia during last week were *six times* the whole share capital) indicate that some holders at least have discounted the advantages of the new arrangement; but of course, the sales and purchases were chiefly speculative, by people who hoped to make a profit on one side on the other by the movement in the market, and the actual transfers of shares have been probably but a small fraction of the sales. The sales, however, and the great advance in prices which has now been maintained for some time show sufficiently that the public takes the new movement very seriously.

The only actual contracts, so far as appears, changing the relations of the several coal producers, are the leases by the Reading of the Lehigh Valley and the Central of New Jersey properties; but it is given out that the Delaware, Lackawanna & Western will act in harmony with the Reading, and that a considerable block of Lackawanna shares has changed hands. Many newspapers have said substantially that this will enable the Reading to control the anthracite trade.

The statistics of anthracite production show that the three companies now controlled by the Reading, shipped from the mines last year 53.3 per cent. of the total production of 40,448,000 tons, against 55½ per cent. in 1890 and 57¾ in 1889, the latter being their largest proportion since 1883. The Lackawanna last year made 15.1 per cent. of the total shipments, and 16.15 in 1890. This leaves about 30 per cent. of the coal not controlled in any way by these two companies. Any one who has followed the history of competition between carriers or producers knows that a proportion half as great as this often defeats entirely the plans supported by a combination of all the rest. In fact, among the railroads it is usually one commanding but a small proportion of the traffic which cuts rates and keeps them down. Why it should be different in the coal trade has not been explained, and the history of that trade indicates that is not different. The Delaware & Hudson, the Erie, the Pennsylvania Railroad Company, with the other small producers, must be considered, and have their special interests, which the control of 69 per cent. of the production will have to reckon with. The Pennsylvania Railroad, it must be remembered, has one-eighth of the shipments (12.8 per cent. last year), and it reaches nearly all the markets. In competition it is not always the party with the largest part of the business which exercises the greatest power in the control of that business. He who is least dependent on that particular business for his support may be very independent in his conduct of it, knowing that what hurts him a little may be fatal to his adversary.

The terms of the leases will give the Central of New Jersey shares 7 per cent. dividends in perpetuity, and the Lehigh Valley 5¼ per cent. this year and 7 per cent. hereafter. The Central of New Jersey divided 6¼ per cent. last year, 6 in 1890, 3 in 1889, and nothing in the four years previous. The reorganization of 1888 put it on a comparatively firm footing, and it has already declared a quarterly dividend at the rate of 7 per cent. when the lease was made. The Lehigh Valley has divided 5 per cent. yearly since 1887, when the dividend was 4½ per cent. It was 4 in 1886, 6 in 1885 and 8 for two years previous.

Further, the Reading agrees to pay both leased companies one-half of any surplus profits above the guaranteed dividends until these dividends amount to 10 per cent. Thus if there is a direct profit on the leases, or either of them, above 7 per cent., the lessee will receive but half of it, unless it exceeds 10 per cent.

The union of the three companies under one management will doubtless permit some economies, though, as each separate company has worked a large property, these economies are not likely to be great in the operation of the railroads. They may be more important in the mining and marketing of the coal, but the experience of the Reading formerly when it worked the Central of New Jersey for four years, does not indicate that very great savings are practicable in that way.

It might be thought that with the control of more than half of the entire production, a considerable saving might be made by working only those mines which can be worked with least cost, so that, for instance, a much larger proportion of the product than heretofore might come from one company's mines. We are not able to say whether there are great differences in the cost of working the different mines now open, but as each company has a very large number of mines, each has doubtless heretofore selected those which it was most advantageous to work; and unless one company has on the average of its mines a great advantage over another, not much could be saved in that way. Moreover each lessee company by the terms of the lease, which gives it half the profits above the guaranteed dividends, has an interest in the maintenance and the increase of the income of the property which it leases. Up to the guaranteed dividend it makes no difference to the lessor if the business which earns the profits is done exclusively with the lessee's property, but their contingent interest in larger profits has doubtless caused the lessor companies to contract that the business shall be conducted so as to make larger profits possible.

The risks of the new arrangement fall on the lessee, which is financially the weakest of the great coal producers. As it does not pay any dividends and has not for many years, the failure to earn the guaranteed dividends of the leased lines on those lines themselves cannot be made good out of its own surplus. There are outstanding, however, first, second and third preference income bonds, whose interest depends on the company's profits, amounting in the aggregate to nearly $59,000,000, full interest on which amounts to about $2,950,000. These, issued under the reorganization of 1888, have not received the full 5 per cent. interest, the first preferred incomes (nearly $24,000,000) having received it in 1889 and this year, but only ¼ per cent. in 1890 and nothing in 1891; the second preferred had

5 in 1889, nothing the next two years, and 4¼ per cent. this year; the only payment on the thirds has been the 2¼ per cent. they received in 1889. The fund out of which the interest on the income bonds is payable cannot be diverted to the payment of rentals on the lines just leased, however. The mortgage under which the incomes were issued defines this fund as the profits derived from all sources, after paying operating expenses, taxes and existing rentals, guarantees and interest charges, *but not fixed charges of the same sort subsequently created.* Thus there seems to be little for the Reading to lose even if it does not earn the rentals on the new leases. The lessors, so far as appears from what has been published regarding the contract, in such case will simply take possession of their property again.

The terms of the lease with the Central of New Jersey will require this year the payment of about $112,000 more for dividends than the company divided last year, and $224,000 more in all succeeding years. For the Lehigh Valley $202,000 more will be required this year and $809,000 thereafter more than its dividends have been since 1887—altogether for the two companies, after this year a little more than a million a year more than last year's dividends. This is a considerable sum; but, on the other hands these two companies earn net more than $11,500,000 per year, and the Reading nearly $10,000,000. Thus an increase of about 5 per cent. in the aggregate net earnings will equal the excess of rental over last year's dividend. As indicated above, no part of this can be taken from the income of the Reading proper until the income bonds have received their full interest, which will require $1,075,000 more than they could be paid from last year's income. To get the rental from the net profits of the leased roads themselves their net profits must be increased by about 9 per cent. in 1893 and afterwards, but by only about 3 per cent. this year.

The Reading, therefore, gains by the new arrangement the chance of materially increasing its income with apparently little risk whatever the result may be; the leased lines have the promise of increased dividends which, if the lessee is able to fulfill its contract, will make their stocks very valuable. What the Lackawanna gains more than any outside coal company is hard to see: but it and all the outside companies must gain by anything which makes the coal business more profitable, and it (and they) will get the whole of the benefit on their share of the business. The Lackawanna has long reported surplus profits much greater than its dividends. The outside companies will, of course, resist any attempt to reduce their percentage of the output; and the Reading, certainly, will not be able to reduce them to subjection by doing business without a profit for a year or so, for it, less than almost any other coal railroad, is able to endure a reduction of profits, and this new contract makes it necessary to increase them. Every outside company, of course, will be delighted if under the new régime the business is made more profitable: but it is always true that competitors wish to have their business profitable; notwithstanding which disposition occasionally it becomes unprofitable.

Equated Emergency Stops—Burlington Brake Tests.

Last week we gave the records of and some deductions from the recent Burlington brake trials, but for lack of time could not give the equated length of the stops. Since then the stops have been compared with each other and with those made with the Westinghouse exhibition train in 1887, and the results of the comparison, which include a consideration of the different grades, are given in the tables on page 140.

The diagram, which appears on page 141, shows graphically the relation which these stops bear to each other. In another column will be found also the diagrams taken from the dynamometer car during the last Burlington tests, which show the variation in pull on the drawbar back of the tender during the various stops.

It has been customary to compare different emergency stops, made under otherwise equal conditions, by squaring the speeds and increasing or decreasing the distance run during a stop in proportion to these squares. This is not strictly correct and may lead to serious errors, and in the tables given with the diagram another plan has been followed which gives a more accurate and just comparison.

In the first place the distances run during the stops are equated according to the train-pipe pressures at the time the brakes are applied, on the assumption that the greater the pressure the shorter will be the stop—that is, that the length of the stops will vary inversely as the pressure in the train pipe when the brakes are applied. Next, the distances are equated by increasing or decreasing them, according to the grade, on the assumption that the length of the stops will be increased or decreased in proportion to the work taken from or stored in the train going up or down a grade, divided by the total energy stored in the train due to its velocity. That is, the distance run, down grade, for instance, bears the same ratio to the equated distance that the total energy in the train, due to its velocity and to the descent of the grade, bears to the energy due to velocity alone. But before these corrections are made one-half the distance which the train runs before the brakes are all on after the movement of the engineer's handle is deducted from the length of the actual stop.

It is evident that a train will run some distance after the engineer's handle is put on the emergency position befor the brakes are applied. This distance varies with the speed. The time interval is about two seconds for a quick-acting, compressed air brake. That is, two seconds is just about one-half of the interval between the movement of the engineer's handle and the full application of the brakes. The full interval is four seconds between no brakes applied and full application, and the effect is about as if the train had run without brakes for two seconds after the movement of the engineer's handle. On this basis the distance run before the brakes are applied varies directly as the speed, and amounts to the distance run in two seconds for the quick acting compressed air brake and would be less than this for an electro-pneumatic brake.

After making these deductions the distances may be compared with considerable accuracy on the basis of the squares of the speeds, but what is better, they may be compared with the lengths of the stops given on the diagram accompanying this, which shows by the curve the length of stop which may be reasonably expected from any good brake when a train is running at the various speeds mentioned and on a level track. The curve is based on the actual trials made with compressed air brakes in this country. The emergency stops, so far recorded, are laid out on the diagram and are indicated by symbols. These stops were all made with 50-car trains without using sand and with 70 per cent. brake leverage. They are equated for a level track and 70 lbs. train-pipe pressure.

On the diagram the horizontal distances represent the different speeds in miles per hour, and the vertical distances to the curve above the zero line the relative distances run after the brakes are applied, and the vertical distances below the zero line to the inclined straight line, distances run before the brakes are applied. The sum of the two is the length of the actual stops at the various speeds, which are easily obtained with a good compressed air brake under the other conditions given on the diagram.

Now if S be the speed in miles per hour, then $1.47\ S$ is the speed in feet per second and $2.94\ S$ is the distance in feet run in two seconds, before the brakes are applied. Also, if a good average stop at 20 miles per hour, less the distance run before the brakes are applied, is 120 feet, then the comparative distance run after the brakes are applied at any other speed, S, will be $\frac{120}{400} S^2$, which equals $.3\ S^2$. Therefore the full distance run will be $.3\ S^2 + 2.94\ S$. This is the formula used and is true for all speeds of which we now have a record when the trains are stopped under the condition given on the diagram. If, however, the brake leverage is greater, or sand is used, or the train-pipe pressure is higher, or a greater friction of brake shoes is attained, then the quantity $.3\ S^2$ may become less, perhaps as low as $.2\ S^2$ under the most favorable conditions, but the value $.3\ S^2$ represents the results so far obtained in freight service and is a value easily equaled in actual service with empty cars.

The curve given corresponds to the formula, and it will be seen that it has a reasonable correspondence to the actual stops thus far recorded. It is more accurate to compare a new set of brake stops with the figures given by the diagram than to compare them directly by squaring the speeds without the corrections mentioned above.

It is interesting to note what the formula reveals as to the length of a stop at some of the high speeds so common of late. Try 70 miles per hour, for instance. The distance is $(.3 \times 4900) + (2.94 \times 70) = 1{,}676$ ft.; and at 90 miles per hour it is 2,700 ft.

These are rather alarming distances for an emergency stop for a passenger train and would still be so even if reduced as much as practicable by a higher leverage. The fact is that the difficulty of stopping within a safe distance is a most serious matter to consider in connection with the remarkably high speeds which so many people are now striving for. Proper braking for high speed trains will soon become a topic of more vital interest with regard to high train speed than locomotive power, and we shall hear more of stopping and less of pulling forces. One wreck at 90 miles an hour will leave an impression not soon forgotten, and we venture to say that when the first emergency stop is made at that speed the engineer will be ready to swear that "the brakes failed to apply," so inefficient will they seem to be, while in fact they can do no better unless radical changes are made in pressures and leverages.

It must be remembered that in the diagram only *empty* cars are considered. If the trains had been fully or even partially loaded the distances would have been greater. That is, the distances above the zero line would have been increased by the ratio of the total weight of cars and loads to the weight of the empty cars: or, what is the same thing, would be inversely proportional to the per cent. of weight braked. The distances below the line are the same for all kinds of trains when a brake is used which fully applies in four seconds.

Persons living in the villages along the Erie road can usually pass away the time while waiting for trains in studying the notices of articles lost and found, and the other items of rural interest with which the walls of the waiting rooms are papered, but this method of mildly amusing themselves is now denied to them, an order having been issued that hereafter, no free miscellaneous advertising will be allowed in the stations. Only posters conveying information as to railroad matters will appear. —*Exchange.*

An example which might be followed by some other large roads, to the decided improvement of their stations. And while they are about it, they might improve the tone of their railroad bulletin boards, including their own official tariffs and time tables. Certain roads which run the most splendid cars in the world have waiting rooms at stations, and not such very small stations, either, which are kept in such slovenly condition that the fastidious passengers in the aforesaid cars would object to riding past them if they knew the true facts. Fly-specked, torn and superannuated tariffs are only one feature of the confusion, however, and it would perhaps be more logical for us to complain of cigar stubs and the filth of tobacco chewers first; but if the division superintendent follows up the bill-boards faithfully he will hardly fail to attack the other points also. Among the numerous inconsistencies to be seen on railroads, the difference in neatness between large new stations and small, old ones is one of the most conspicuous; and yet the principal factor in the necessary remedy is nothing more than persistent attention on the part of the superintendent. He does not need to introduce new methods and not, generally, new men. But he must put in a good share of his time and patience for a while.

The engineering department of the Pennsylvania Railroad has issued the usual annual record of transportation lines owned, operated by, and associated with that company. The total miles of main line east of Pittsburgh and Erie are 4,757.45, of which 324 miles are canals and ferries. The miles of track east of Pittsburgh and Erie are 8,546.9, of which 1,092.8 are second track, 295.2 third track, 171.3 fourth track. The company's sidings amount in length to nearly one-half the length of main line track, that is, there is about one mile of siding to every two miles of main line. West of Pittsburgh and Erie the Northwest System has 1,006.6 miles of first track, 127.2 of second track and 558.4 of company's sidings. Here it will be seen that the proportion of sidings is even greater than that east of Pittsburgh and Erie, being about 1 mile for every 1.8 mile of main line. The Southwest System has 1,655.1 miles of first track, 153 miles of second track and 524.5 miles of company's sidings. All lines west of Pittsburgh and Erie aggregate 3,412.8 miles of first track, 282.9 miles of second track and 1,270.8 miles of company's sidings. The grand summary, then, that is, for all lines east and west of Pittsburgh and Erie, is, first track, 7,845.8 miles, total track, 13,676.6 miles. The increase during the year was 102.1 miles of railroad and 374.7 miles of track.

The gross earnings of 139 roads for January were $39,718,075, or $903,796, greater than in 1891. This increase is 2.57 per cent. The increase in mileage operated by the same railroads was 2.2 per cent. The January increases for three years were, 1891, $2,160,328; 1890, $4,003,039; 1889, $2,309,922. The *Chronicle* ascribes the relative falling off in gains to the facts that there was one less working day in January, 1892, that the weather was bad in many parts of the country, that in the South and on the Pacific Coast there was severe business depression, that there was a heavy falling off in the cotton movement, and that there were diminished receipts of hogs and provisions in the West. The receipts of cotton at 13 ports were 203,688 bales, or 25.4 per cent. less than in the same month of 1891. On the other hand the grain movement was very much greater than in 1891. The receipts of wheat, corn and oats at the nine great markets were 32,879,912 bushels, or 13,653,000 bushels more than in 1891. The great falling off in earnings was in the South and the great gain in the Northwest.

The furnaces in blast at the end of last year had a weekly capacity less by some 1,500 tons than those in blast on the last of November, and people either hoped

or feared that the large production of December would not be equaled by that of January. The returns show, however, that there was virtually the same furnace capacity on the first of January as on the last of November, and somewhat over 850,000 gross tons was made last month. With such an output, at the rate of over 10,000,000 tons per annum, it is of course useless to expect any boom in prices, or in fact any business except for direct consumption; for with No. 1 anthracite quoted at $17.00@$17.50, and Bessemer pig at $15.25@$15.50, no one is apt to sell for a fall; and with over 30 per cent. of the furnace capacity out of blast, purchases for a rise are equally improbable.

The Baltimore & Ohio has just put 32 miles more of its Philadelphia division under the block system, and now has the whole of that division so operated. The signals will soon be completed throughout the line from Philadelphia via Washington to Cumberland, Md., 288 miles; but the Baltimore paper which thinks this is the longest single stretch of block signals in the country is a little "off." Among the other blocking recently put in effect is that on 27 miles of the Western Pennsylvania division of the Pennsylvania road. Two items omitted from our table of block signaling, printed Feb. 5, were: Chicago, Burlington & Quincy, 34 miles, and Cincinnati, New Orleans & Texas Pacific, 32 miles, both non-automatic.

The project for a metropolitan railroad in Paris is still in dispute. Last July the Municipal Council acted favorably upon a general scheme, and an offer was made by the Crédit Foncier to furnish 120,000,000 francs to carry out the project. The Minister of Public Works did not accept the plan proposed by the Municipal Council, and he will present this month a draft of a bill for a metropolitan railroad, and final plans and studies are in preparation, which will be submitted very soon for examination by the General Council of the Corps of Bridges and Highways.

An important application of steel cross ties is about to be made. The Chief Engineer of the New York Central & Hudson River Railroad has just signed a contract for 33,500 Hartford steel ties, to be laid in the track between the Grand Central Station yard and Mott Haven Junction. The four tracks will be laid with this tie, and with rails of 100-lbs. section. It will be remembered that this tie was put in experimentally at Garrison's nearly three years ago. Its service there has been so satisfactory that this further trial of it is decided upon.

NEW PUBLICATIONS.

A Manual of the Steam Engine.—Part II. Design, Construction and Operation for Engineers and Technical Schools. By Robert H. Thurston, A. M., LL.D., Dr. Eng., Director of Sibley College, Cornell University, etc., etc. New York: John Wiley & Sons. 1892.

This book, of about 900 pages, contains eight chapters and an appendix. Chapter I. (231 pages) treats of the "Design of the Steam Engine," and must be judged, as must the whole book, from the standpoint of the reader to whom avowedly it is addressed. Briefly, then, it must be said that the engineer who is a designer will not get any information that he does not already possess which he can put to any practical use, while the engineer who is not a designer and the advanced student will find the chapter to be diffuse and confusing, without unity of treatment, and rambling not only in general arrangement, but in details. There is no figuring up the specific strains and showing how and why they are met in practice, in a certain way, such as was attempted, for instance, in Prof. W. D. Marks' little book on the "Proportions of the Steam Engine," which, whatever its shortcomings, was at least an attempt in the direction of rationalizing or getting at the reason of design as practiced. Were the chapter entitled "Something Relating to All Kinds of Steam Engines and Their Appurtenances," we should find no fault, for this, would have saved us the task of reading the chapter with the greatest care in the hope of finding some new, important and exact data in practical design which we might commend.

Chapter II. (124 pages), on "Valves and Gearing and Steam Distribution," contains little which is not to be had in better form in special books on the subject. Chapter III. (117 pages), on the "Regulation of the Engine," treats of governors, fly-wheels, inertia and rotative effects. Chapter IV. (69 pages), on "Steam Engine Construction and Erection," contains some data about the strength and wearing qualities of the materials used, and generalities as to erection. Chapter V. (39 pages), on the "Operation, Care and Management of Engines and Boilers," in the nature of things, reports matters which the experienced know, and which the inexperienced can only learn in practice. Chapter VI. (138 pages), on "Engines and Boiler Trials," is largely condensed from the author's "Handbook of Engine and Boiler Trials." Chapter VII. (58 pages), on "Specifications and Contracts," contains some typical specifications and contracts, and some hints and cautions useful to any engineer.

Chapter VIII. (118 pages) is on "Finance." In his preface the author says that he "expects that this will excite more interest and very probably more criticism than any other in the book," and designates it as "a first attempt to introduce the financial element into the theory and practice of steam engine construction." We see no reason for expecting special criticism except in one important particular. Some of the figures presented are legitimately subject to doubt as to their accuracy, but otherwise there is nothing startling about this chapter except the statement in the preface that it is "a first attempt to introduce the financial element into the theory and practice of steam engine construction," in the way of "scientific methods of computation of minima." We call to mind Rankine's papers in the *Philosophical Magazine* in 1854 and before the British Institution of Naval Architects in 1866, Wolff and Denton's papers in the *Transactions* Am. Soc. of Mech. Engrs. in 1881; Mr. Bleychenden's papers on Boilers in London *Engineering*, 1881 or 1882, and the numerous contributions on the finance of engine and boiler practice which have appeared in America since the publication of Wolff and Denton's papers in 1881, using "scientific methods of computation of minima" in introducing "the financial element into the theory and practice of steam engine construction."

Altogether we cannot put quite so high a value on the second part of Prof. Thurston's "Manual of the Steam Engine," as we did on Part I., which was reviewed in our issue of Oct. 9, 1891.

Proceedings of the Twentieth Meeting of the American Society of Railroad Superintendents. Oct. 12, 1891. Secretary, C. A. Hammond, Superintendent of the Boston, Revere Beach & Lynn Railroad, 350 Atlantic avenue, Boston, Mass.

The proceedings of this meeting have been collected in full in a pamphlet of 106 pages. We shall not attempt any abstract or review of the pamphlet, as the substance of it has already been given at more or less length in the current reports of the meeting in the *Railroad Gazette*. There is, however, a very interesting and valuable appendix, which is a report made by Mr. Ashbel Welch in 1866 to a general railroad convention held in New York. Mr. Welch reported to this convention as the Chairman of a committee on safety signals and regulations. He was a man of such acuteness and intellectual thoroughness that it is not surprising to those who knew him to see how completely he had grasped the principles of signaling and to what extent he anticipated in general the practice of to-day.

He laid down the broad principle that signals should be safety signals, and not danger signals. The reasons for this are sufficiently well understood now, but they are explained very clearly and illustrated by actual examples in Mr. Welch's report. The telegraphic block system is recommended for important double track railroads, and the fallacy of the time interval system is explained. A telegraphic block system had been in use a year between Philadelphia and New Brunswick on the main passenger route between Philadelphia and New York, and Mr. Welch explains briefly the plan of working it, which included the rule that the operator should not fasten the signal in the safety position.

Signals to be interlocked with drawbridges and switches are also recommended, and it is held that they should be so contrived that when out of order they will be out of sight. The absence of a signal will then require a train to stop until the cause of this absence is ascertained. Mr. Welch also pointed out the principle that signals should be placed at known and conspicuous points where they will always be looked for and therefore most likely to be observed, and said that signalmen should be so circumstanced as to be kept cool and alert, not distracted by too many engagements, and comfortably sheltered. In this very brief report, which covers but little more than two of the pages of the pamphlet containing it, numerous other important and interesting requirements are laid down.

Pocket-Companion containing Useful Information and Tables Appertaining to the use of Wrought Iron and Steel as manufactured by Carnegie, Phipps & Co., Ltd. Edited by C. L. Strobel, C. E., assisted by F. H. Kindl, C. E. Pp. 334, 12mo., with Index. Pittsburgh: Carnegie, Phipps & Co., Ltd., 1892. Price, $2.

The most important new features of this new edition are said to be changes in the numbering of sections, giving a methodical arrangement, the representation in the lithographs of the sections, as rolled in the several finishing passes, for the same size of shape; the indication by different colors of the sections rolled in iron or steel or both; and revised specifications for constructional iron and steel.

Fifty-eight pages of this admirably arranged and well-printed book are given to lithographs of the great variety of shapes produced. I-beams are shown from 24 in. and 100 lbs. per foot down to 3 in. 5.5 lbs. per foot. Channels, Z-bars, angles, tees, and odd shapes are shown in great variety; but perhaps the greatest variety is in angles, of equal and unequal legs. Special tables and cuts are given of standard connections and details for I-beams and Z-bar columns, and there are short chapters on the steel and fireproof building construction.

Over 50 pages of the book are taken up with most valuable and useful tables of safe loads, spacing, and properties of the various shapes. These are followed by built up girders and columns, by tables of weights of flat rolled iron and steel and of square and round bars, and by many of the useful tables found in other pocket books.

Twelfth Annual Report of the Board of Railroad Commissioners of California, to Nov. 1, 1891.

This report is a collection of the hearings and findings of the Commission, with statistical tables showing the financial condition, traffic, wages of employés and equipment, etc., of the California railroads. The reports of the railroad companies of the state to the Board are also given. There is no discussion by the Board of the facts presented, and we are glad to say that no recommendation is made for additional legistation or increase of the powers of the Commission. This is certainly a rare and admirable quality, and for which the report is to be greatly commended at a time when every man who happens to be appointed on a railroad commission thinks that he should be at once vested with magisterial power.

The Stevens Indicator. January, 1892.

In this paper is continued the publication of Professor Coleman Sellers' lectures in the Department of Engineering Practice. The lectures here published, by abstract, is on Transmission of Motion.

Distance Run in Emergency Stops at Various Speeds.

The table shows distances run with air braked trains in emergency stops at various speeds. The stops are equated on a new basis, which is explained in the editorial columns. This table includes, we believe, all authentic stops, of record, which have been made up to this date in this country with a quick-acting, compressed air brake, operated solely by air. Seventy per cent. of the total train weight is braked. The results are such as can be duplicated in actual service with the same proportion of pressure on brake-shoes. The diagram and tables are discussed in the editorial columns, page 139.

Brake.	Speed, miles per hour.	Distance, ft.	Grade, ft. per mile.	Train pipe pressure, lbs.	Distance run before brakes apply.	Distance run after brakes apply.	Equivalent distance on level.	Equivalent distance, 70 lbs. press. in train pipe.
Westinghouse, 1887	19	172	13.6	70	56	116	113	113
" "	36	490	13.6	70	106	384	376	376
" "	22	184	..	70	64	120	120	120
" "	37	470	....	70	108	372	372	372
" "	20	176	52.8	70	58	118	109	109
" "	36	507	52.8	70	106	401	369	339
" "	25	284	50.0	70	74	210	193	193
" "	35	542	50.0	70	102	440	401	401
" "	24	265	40.0	70	76	189	178	178
" "	43	718	40.0	70	126	692	641	641
" "	21	214	32.2	70	62	152	143	143
" "	40	679	32.2	70	114	565	533	533
" "	20	158	35.0	70	58	100	96	96
" "	36	560	35.0	70	106	454	4.6	426
" "	19	123	40.0	70	56	67	64	64
" "	32	406	40.0	70	94	312	293	293
" "	23	20	53.0	70	68	135	126	126
" "	41	671	53.0	70	120	554	507	507
" "	23	264	44.0	70	68	198	180	180
" "	36	59	44.0	70	106	487	448	448
" "	19	119	52.0	70	56	105	93	95
" "	42	694	52.0	70	124	57	523	523
" "	20	194	47.0	70	58	136	125	125
" "	40	649	47.0	70	118	53	490	490
Westinghouse at Burlington, 1892	23	239	....	70	68	171	171	171
" "	30	384		70	88	296	296	296
" "	19	162	53.0	72	56	106	98	101
" "	36	646	53.0	70	106	540	483	483
" "	23	282	....	72	68	214	214	220
" "	32	386	....	71	94	298	292	296
" "	22.5	238	53.0	68	66	172	157	153
" "	33.5	561	53.0	68	98	463	414	402
" "	24.5	283		68	72	211	211	205
" "	31	417	....	67	91	326	306	312
" "	21	190	53.0	69	62	128	119	117
New York at Burlington, 1892	15	93	....	70	44	49	49	49
" "	26	297	....	72	76	221	221	227
" "	31	360		70	91	269	269	269
" "	18	156	53.0	70	53	103	94	94
" "	36	574	53.0	70	106	468	425	425

City & South London Railway.

The second half yearly meeting of this underground electric line (Greathead) was held Feb. 2, to again receive an announcement of no dividend.

The average fare per passenger was stated by the Chairman to be now only 1.7d., as against 1.9d. during last half year, but this excluded season ticket holders and was more than made up by an increased number of passengers, so that for the half year the total receipts had gone up £600—say $3,000.

The train mile receipts for the half year are 51 cents as against $1.20, the average of all English steam railways. The train mile expenses are bare 40 cents, against 66 cents on an average steam line. This is 76 per cent. of the receipts, a high figure, which the Chairman set down partially to having to work the elevators, although this were a hardship unforeseen by the promoters of the line. The cost of working the lifts was stated as 9½ per cent. of the gross receipts, a heavy item, certainly, but one which could have been well foreseen. He also said that if they added 50 per cent. to their gross receipts, the working expenses would then be only 45 per cent., about equivalent to telling a man that if you add 50 per cent. to his wages he will be earning more money.

The locomotive expenses were 15.76 cents per train mile, which is a trifle under the 18 cent rate of the Northwestern Railway with its heavy trains; not a very reassuring matter after all for a small train of three light, long tramcars at most, for the electric cars are but this. The number of passengers per train averaged 47. They carried practically five passengers per ton of total train

load. The electric motors were taking, the Chairman said, trains of three or four times their own weight at an average speed of 13 miles per hour, including stoppages.

It appears that King William street terminal station has been a source of great inconvenience and the company would do well to take their line right through the city so as to obtain a terminus and siding-room outside—presumably upon the surface.

It appears, too, that there has been more trouble with the armatures of the motors and these were all being gradually renewed on an improved method, and there has been, it is claimed, no trouble from any rewound armature. The trouble all arose at the heavy gradient to the city terminus, which is really a very awkward place. The fact remains, however, that the number of passengers on the line is by no means small, that, after all, the train expenses are not so enormously heavy, but still there is no dividend, and we see no reason for with drawing from the position taken up by the *Railroad Gazette* that the nature of the line and its enormous constructional, or at least capital, cost is against the possibility of paying a dividend on the ordinary stock.

The ventilation of the tunnel is no better and the general public are finding out that impure railroad air need not necessarily be sulphurous. Nothing but positive ventilation will make this subway bearable, especially to those who recognize its present impurity.

M. AM. SOC. C. E.

Twelve Months' Foreign Trade.

Statistician Broeck's report on our foreign commerce shows increase in both sales and purchases. The figures for the calendar years are as below:

	1891.	1890.
IMPORTS.		
Free of duty	$429,326,769	$288,528,328
Dutiable	398,987,121	534,869,398
Total	$828,313,890	$823,397,726
EXPORTS.		
Domestic	$957,339,705	$845,999,603
Foreign	13,176,095	11,502,945
Total	$970,515,800	$857,502,548

This is the largest foreign trade the country has ever had and it leaves a tidy little balance in our favor with which to offset the value of stocks and bonds returned to us as a consequence of financial troubles abroad. On account of the change in the tariff there have been large gains and losses in the free and dutiable imports, as with sugar and molasses, where the imports of duty free have increased by over 80 million dollars worth and the value of dutiable has decreased by nearly 63 million dollars, and the change of duty on woolen manufactures decreased their imports by nearly 20 million dollars, or 37 per cent., while the value of wool imported has increased by about 3½ millions, or 21 per cent. Hemp and its manufacturers has decreased by 14¼ millions, or 54 per cent., and tobacco and manufactures by 11¼ millions, or 50 per cent. Itemizing exports we find increases for 1891 over 1890 as follows:

	Inc. Value.	Percentage.
Copper and manufactures	9,785,000	165
Cotton " "	24,960,000	11
Wheat and Wheat flour	102,905,000	107
Iron and steel and manufactures	3,736,000	14
Breadstuffs except wheat and corn	5,845,000	73
Leather and manufactures	1,030,000	8.5
Coal	1,404,000	19

And we find the following items in the export of which there has been a decrease, viz.:

	Dec. in value.	Percentage.
Meat and dairy products	$11,186,000	8
Crude and refined petroleum	6,993,000	14
Live cattle	4,946,000	15
Wood and manufactures	3,248,000	12
Tobacco and manufactures	540,000	2
Indian corn and meal	17,750,000	46

A Hudson Bay Route to Liverpool.

When we come to deal with geographical facts our previous conceptions sometimes undergo radical changes. For instance, it is somewhat of a shock to most people to be told that the whole of South America lies east of the meridian of Cleveland, O., or that, with all the railroads leading from Chicago through the Southwest, the shortest route from that city to the Mexican capital is by way of New Orleans. So, many people have been surprised to realize that it was much shorter to Japan *via* the Canadian Pacific Railroad and Vancouver than *via* San Francisco. Now Senator Cushman K. Davis, in an article on "Our Lake Commerce and Ways to the Sea," in the February *Forum*, points out that the rational route, as regards distance, from the northwest of our own country, as well as of Canada, to Liverpool, is by way of Hudson Bay.

From the northern boundary of Minnesota to the excellent harbor of Churchill is only 800 miles. The City of Winnipeg is 1,424 miles from Montreal and 1,800 miles from New York by rail, and the three harbors of New York, Montreal and Churchill are practically equidistant from Liverpool. The Canadian government has already investigated the feasibility of this route, as well as the practicability of navigation in Hudson Bay, the ship "Neptune" having been sent from Halifax in 1878 upon this mission. The report was favorable, and the long record of the Hudson Bay Co., which sent a ship yearly to its trading post of Moose Factory from 1736 to 1864 demonstrates that the harbors are free of ice from the middle of June to the middle of November. "The average time during which the port of Montreal has been open is from May 2 to Nov. 23." It is also stated that the waters of Hudson Bay are 10 degrees warmer than those of Lake Superior.

A Sketch of the History of the Compound Locomotive.

Mechanical Engineer's Office,
ALTOONA, Pa., Jan. 23, 1892.

The idea was first suggested in 1834 in an old French patent. The first one actually built was in 1850 in England for the Eastern Counties Railway. An engineman, named John Nicholson, designed the two compounds, of which the superintendent of motive power two years later said the results obtained were satisfactory. It was a two-cylinder compound, as are the majority now in use in Europe, but the steam distribution and expansion were very faulty. There was a "starting valve" by which, when the high pressure piston was on centres at starting, steam could be admitted directly to the low pressure cylinder. In a drawing of Feb. 13, 1860, Ebenezer Kemp proposed a four-cylinder compound. November, 1836, Jules Morandiere, of the Northern Railroad of France, proposed in a letter to *Engineering*, a three-cylinder compound for the Metropolitan of London.

In 1868 the Erie railroad furnished a 16 × 26 Hinkley locomotive to the Shepard Iron Works of Buffalo, N. Y., to be compounded by them. It was made into a four-cylinder tandem compound after the designs of H. O. Perry, and probably Mr. Lay, an assistant engineer in the navy and inventor of the Lay torpedo. This was the first four-cylinder compound locomotive ever run. The cylinders were 11½ in. and 24 in. × 26 in. stroke and had rocking steam-chest valves. It was not a success, being a poor steamer because, as was said of it, "there was no exhaust." The exhaust was probably weak, because of too great expansion in the cylinders.

About 1870, and for several years after, the Worcester and Shrewsbury Railroad, of Massachusetts, a short, narrow-gauge road, had in use a compound steam passenger car. The high-pressure cylinder had a diameter of 5 in. and the low-pressure 8 in. There was a starting valve for using boiler steam in both cylinders. A similar car, but with simple cylinders 6 in. in diameter, ran with it. It was said by those most intimately connected with their working that the compound used only three-fourths as much fuel as its companion.

June 20, 1872, Wm. Dawes took out a patent No. 1857 on a plan for a four-cylinder compound. His description of starting devices is remarkably similar to the Lindner system,

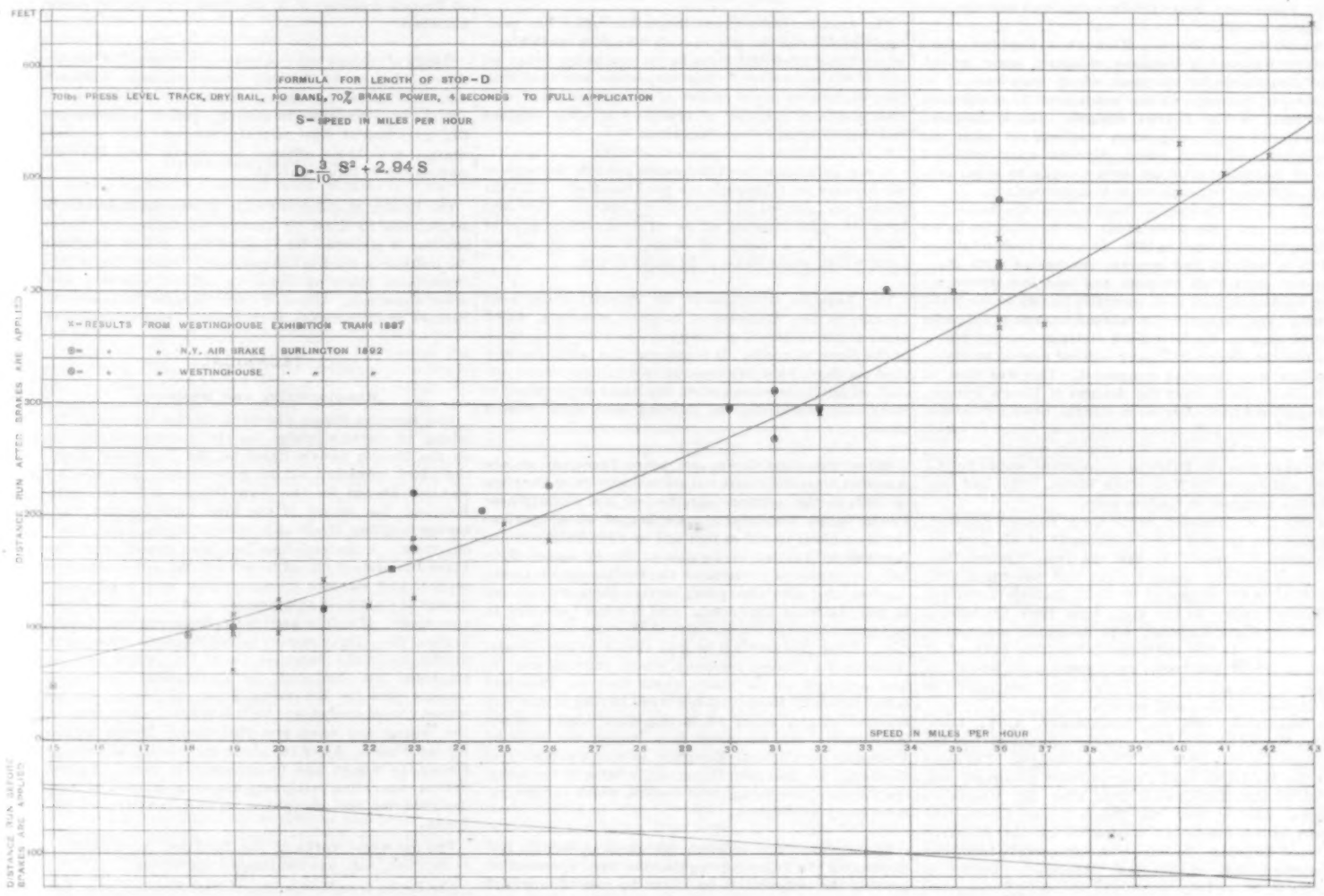

DIAGRAM OF EMERGENCY STOPS WITH AIR BRAKES.

See Page 139 for Discussion.

The real commencement of the successful introduction of compound locomotives was in 1876 when Anatole Mallet, a Frenchman, designed three locomotives for the Bayonne & Biarritz Railroad. These were built by Schneider & Co., of Creusôt, France. They were so eminently successful that in July, 1886, just 10 years after they went on the road, that railroad was operated exclusively by compounds. They are two-cylinder locomotives and can be worked simple or compound at any time on the road at the will of the engineman. These original three locomotives were still in use when last heard from. Mallet's system was widely adopted, soon being in operation on the Paris & Orleans Railroad, the Northern of Spain, Russian Southwestern, Western Switzerland and several German roads. It was used on the Austrian "Kaiser Ferdinand Nord Bahn," in June, 1879. Plans for a four-cylinder compound were got out by Mallet in 1877.

In 1880, Mr. von Borries, Mechanical Engineer of the Hanover Railroad in Germany, designed some two-cylinder compounds for his road, which were built by F. Shichau, of Elbing. In six years over 20 compounds were built to Von Borries' designs. His locomotives could be run simple only when starting, not after one revolution had taken place. Shichau soon furnished several locomotives of his own designs to other railroads, differing but little from Von Borries'.

F. W. Webb, Mechanical Engineer of the London & Northwestern, altered one of his old locomotives into a Mallet type compound in 1878. It was so successful that in 1881 he built his first express locomotive with three cylinders—two high pressure and one low pressure—from his own design, since so widely known as the Webb system. The Pennsylvania railroad has one of his make now running on the New York division.

In 1883 the Boston & Albany railroad altered an old locomotive into a tandem compound. This was done at Springfield, Mass., after the designs of Henry Dunbar. It was altered back after seven months, probably because of wrong design and steam distribution, errors to which the compound locomotive is extremely sensitive.

The same year the Baldwin locomotive works built a compound engine for New South Wales. This had four cylinders arranged in tandem pairs.

In 1885 T. W. Worsdell, of the Great Eastern Railway, England, ran the first three compounds of his own design upon his road. In 1886 the Great Western Railway, England, was using freight and passenger compounds after the designs of W. Dean, its Superintendent of Motive Power. At the same time Herr Lindner, of the Saxony State Railroad, was designing compounds at Chemnitz. In 1887 the Grazi & Tsaritsin railroad of Southeastern Russia began using compounds; and all its simple engines are being converted into compounds as fast as shop facilities will permit.

In September, 1889, the Schenectady, N. Y., Locomotive Works built a two-cylinder compound for the Michigan Central, after Mr. Pitkin's designs. The same year the Baldwins built a four-cylinder passenger compound for the Baltimore & Ohio, after Mr. Vauclain's designs. Also in 1889, the Rhode Island Locomotive Works built a compound locomotive for the Brooklyn Elevated Railroad. In July, 1890, Schenectady furnished three compounds to the East Tennessee, Virginia & Georgia R. R., and the same year the second compound to the Michigan Central.

In 1891 came F. W. Dean's two-cylinder (Old Colony Railroad) compound and his Lehigh Valley Railroad compound; the two-cylinder compound built by the Brooks Locomotive Works, of Dunkirk, N. Y., for the Lake Shore & Michigan Southern; the large two-cylinder passenger compound of the Rhode Island Works; the six Mexican Central "Johnstone" compounds, with low-pressure cylinder surrounding the high-pressure cylinder, built at the Rhode Island Works, as also their additional elevated compounds, and an order for a competitive test compound from the Chicago, Milwaukee & St. Paul, it being also at the service of the Master Mechanics' committee, Schenectady's Southern Pacific, and compounds building for Atchison, Topeka & Santa Fe, a second order of five for the Southern Pacific, two for the Adirondack & St. Lawrence, two for New York Central. The Baldwins furnished compounds to the Northern Pacific, the Los Angeles Terminal Railroad Company, five to the Pennsylvania, to the New York, Lake Erie & Western; the Western New York & Pennsylvania; also, building or ordered for the Central of New Jersey; Buffalo, Rochester & Pittsburgh; Abt Pike's Peak rack railroad, 21 for Philadelphia & Reading, Pennsylvania & Northwestern; two for use of the Master Mechanics' Committee, Lehigh Valley, Sinnemahoning Valley; Cincinnati, New Orleans & Texas Pacific; Lehigh & Lackawanna; New York, Lake Erie & Western.

More than a year ago there were in use in the world over 1,000 compounds, of which 750 were of the two-cylinder type. Nov. 1, 1891, there were 1,358 compound locomotives, either in service or in course of construction. Last year was remarkable in the history of compounds for their progress in America. Up to this time the Baldwin Works have furnished 101, the Schenectady 13, the Rhode Island 12, the Brooks 1, Lehigh Valley Railroad 1, Chicago, Burlington & Quincy 1, Old Colony 1; total, 130.

As an indication of the future of the compound principle, M. De Borodine, of the Southwest Russian lines, said a year since: "We have a dozen compounds in service several years, and they have given such satisfactory results that all those which we build in future will be compound." Plans have been proposed by a German engineer for even triple expansion locomotives, but none built so far as I know. Perhaps when we see the 250-lb. pressure, predicted by Mr. Speirs in the *Railroad Gazette* of Jan. 22, we shall see accompanying it the triple-expansion locomotive.

H. Wade Hibbard.

Foreign Railroad Notes.

The Austrian Ministry of Public Works directs that in future cattle shipped from Galicia or Bukowina to Vienna must be fed and watered immediately before they are delivered to the railroad or they will not be carried.

The Austrian Government inspection office has positively prohibited the practice of "English switching," which being described turns out to be making what we call a "flying switch." The inspectors say that they have discovered in the course of investigations of railroad accidents that this is practiced at some stations and that it is "doubtless dangerous."

A new petroleum tariff in Austria reduces the rate to one kreuzer per kilometric ton per kilometer = 0.71 cent per ton per mile, for oil in barrels or tank cars. Two days are allowed for drawing off the oil from tank cars, after which there is a charge of about 10 cents per car per hour, which ought to keep the cars moving.

The Austrian Government has recently made some changes in the uniforms of railroad employés, which apply to the employés of companies as well as to those of the State railroads. It is ordered that when the railroad employés have to co-operate with Government officials on public occasions when the latter are required to wear their uniforms, the railroad men must wear a sword.

Baron von Czedik, for ten years President of the Austrian State Railroads, retired on a pension at the close of 1891, to the general surprise of his countrymen. Czedik began his career as a teacher, of all occupations the least likely to end in political or administrative distinction in Austria or Germany. At the age of 29, in 1861, he became a member of the Parliament of Lower Austria, and after nine years' service there was chosen to the National Parliament, and in a few years had an important office in the Ministry of Worship and Instruction. From this position he was chosen in 1875 General Director of a railroad company, whose railroad was the first acquired by the state, which took its President with the road. He is credited with having been a very efficient officer, under whom important improvements were made. His successor is a Doctor von Bilinski, Professor of Political Economy in the University of Lemberg, who has recently argued in favor of the decentralization of the railroads of Galicia, which the government has just acquired.

At a conference of railroad managers in Austria last September the following regulations were approved regarding the measures to be taken in case of very high winds: Trains should not be dispatched in such winds containing any empty cars, or open cars containing hay, straw or boards or loaded with vehicles, or generally with less than three-fourths of their maximum load. The number of cars in a train should be reduced, and in mixed trains at least two or three loaded freight cars should be behind the passenger cars. The cars should be coupled carefully and the couplings screwed up tight. The trainmen, both at the station where the train starts and at the intermediate stations, should see that the cadoors are properly fastened. In case the station master is informed by the officers in charge of maintenance-of-way that there is danger from the storm to trains running over the road he should stop all trains, and the trains on the line should be held at way stations until the news is more favorable. In such case special care must be taken to accommodate the passengers and protect the mails.

For the first seven months of 1891 the passenger traffic of the Hungarian railroads (it being the second year of the zone traffic) was nearly one-fourth greater than in 1890, and the passenger earnings 9½ per cent. greater, indicating that the chief increase was in the local travel.

The university lectures on railroad subjects announced for the winter half-year in Prussia are as follows: In Berlin, lectures on Prussian railroad law and on the operation of railroads; in Breslau, the same as in Berlin and also on the political economy of railroads, especially railroad rates, and on the administration of the Prussian State Railroads and also on railroad technology. In Cologne lectures will be given in the office building of one of the State Railroad Directories on Prussian railroad law and on technology.

At the beginning of this year the German Railroad Union included 72 different railroad managements, 41 of which were German, 21 Austro-Hungarian, 4 Dutch, 1 Luxemburg, 3 Belgian, 1 Roumanian, and 1 Russian (Polish). These in the aggregate worked 46,882 miles of railroad, the Prussian State Railroads forming one-third of the whole. The German Railroads in the Union have 26,141 miles, the Austro-Hungarian, 16,677; all the others, 4,064. The addition to the mileage in the Union during 1891 was 799 miles.

The little Duchy of Luxemburg is probably the only country in the world whose national song refers to railroads. Their song is entitled "The Locomotive" (the feierwôn, or firewagon) and was written to celebrate the opening of the first railroad in Luxemburg in 1859. It owes its popularity to its praises of the land and its declaration that the Luxemburgers "will remain what they are"—that is, independent. The duchy has only 1,000 square miles of territory and 215,000 inhabitants. Being shut in between Belgium on the west and Germany on the east and south (also with about five miles of French frontier) it is continually in fear of being absorbed.

Gangs of robbers have occasionally swooped down on the employés of the Russian Trans-Caucasian Railroad and also on its passenger trains, and recently these attacks have occurred frequently; and in consequence the government has recently ordered that persons charged with these offenses henceforth shall be tried summarily by court martial.

The French Minister of Public Works has appointed a commission to draw up uniform regulations for the inspection of materials for construction, and to establish the units to be used in comparisons. One section of this commission takes up metals; a second, masonry and other materials. Alfred Picard, General Inspector of Bridges and Highways, is chairman of this commission.

TECHNICAL.

Manufacturing and Business.

The Bucyrus Steam Shovel & Dredge Co. is just finishing an elevator dredge for the government for use on the Muscle Shoals Canal on the Tennessee River, the third furnished to the government; and also an elevator dredge for the New Orleans & Northeastern Railroad, the second of the kind built for the road, for use in filling the 23-mile trestle across Lake Pontchartrain. A contract has just been closed with the Plant Investment Co., of New York, for a combination suction and elevator dredge, which will be the only dredge of its kind in this country, and one of the finest ever made. It will be used in the improvement of Port Tampa, Fla. The company is building some very heavy machinery for the Suwanee Canal Co., which will be employed for draining the Okefenokee Swamp in Georgia, also for Breymann Bros., of Toledo, O., for whom a large dredge was built last year, what will be the largest and most powerful dipper dredge in the United States. All of the above are worthy of note as among the largest and finest machines built. A great deal of excavating machinery has been ordered of late, designed for the phosphate mining industry of the South.

The car wheel works of the Bluffton Car-Wheel Co. at Bluffton, Ala., has commenced operations.

The Berlin Iron Bridge Co., of East Berlin, Conn., has taken the contract for a new boiler shop for the Dry Dock Engine Works at Detroit, Mich. The building will be 68 ft. in width by 201 ft. in length and will be designed and built entirely from the foundations by the Berlin Bridge Co., ready for the machinery. The contract includes not only the iron work, but the foundations and brick work.

The Great Northern is putting the Chicago Grain Door on all box cars built or going through the shops.

The ventilating apparatus made by the Perry Ventilator Co., of New York, has been recently applied on four cars of the Old Colony and on six cars of the Pacific Short Line, and has been very satisfactory.

The organization of the Toledo Bridge Co., which was incorporated over a year ago, was completed at a meeting in Toledo, O., Feb. 14. The capital stock is $100,000, all of which has been subscribed. The new firm will succeed the Smith Bridge Company, whose plant has been purchased, about March 1. It has had an option on these bridge works for some time. The following are the directors of the new company: J. A. Huston, President and General Manager; E. W. Tolerton, Vice-President; E. B. Smith, Secretary, George P. Waldorf, Treasurer; F. J. Zwelling, Superintendent, and H. A. Duer, Engineer.

New Shops and Stations.

Work on the new shops for the Norfolk & Western, at Lambert's Point, Va., will be commenced this week. The intention is to have the new plant completed by June 1, if possible. The buildings and yard work are to cost about $50,000.

The Chesapeake & Ohio has awarded a contract to Rose & Sanford, of Baltimore, for erecting a two deck freight pier 600 ft. long at Newport News, Va. The same firm has also secured the contract for building the $100,000 passenger station at the same place.

The plans for the new passenger station and car shops of the Grand Trunk at London, Ont., have been prepared, and probably the construction will begin within a month.

[An Electric Freight Railroad.

The locating survey of the Rockland, Thomaston & Camden Electric Railroad has been completed by an engineer of the Edison General Electric Co. It will extend from Rockland, Me., through Rockport, to the north side of Camden village, a distance of 9½ miles. The road will be in operation by June 1, and will carry freight and mail as well as passengers.

The Pecos Viaduct.

The cantilever arms of the viaduct being built by the Southern Pacific, over Pecos River, near Shumla, Tex., were connected Feb. 16. The bridge or viaduct proper is 2,180 ft. long, and the top of the structure is 328 ft. above the river, which flows through a deep cañon. The height from the bottom of the river to the rail is 330 ft. The cantilever span is 185 ft. long, and there are 48 spans altogether., most of the spans being iron girders, and alternately 35 and 65 ft. long. The bases of the towers are 35 x 100 ft., and the highest tower is 321 ft., the columns of all resting on a ledge 25 ft. high. The Phenix Bridge Co. has the contract for the iron and steel work, and Ricker, Lee & Co., of Galveston, Tex., have that for the masonry.

Destination Indicator.

A device embodying several novel features is in use at the Broad Street Station, Philadelphia, to exhibit placards describing the various trains that are ready to receive passengers. It consists of a rectangular box, about 5 ft. high and 2 ft. square, in which are placed any number of placards (made of stiff cloth, similar to window shades), and with a glass-covered opening in the upper half of the front side large enough to exhibit any one of the placards. A box is placed against each track and it contains all the placards likely to be needed for that track. The apparatus for bringing into view the particular placard desired is governed by a small metal disc on the outside of the box. The circumference of this has holes to receive metal pegs and the insertion of a peg in the hole numbered, say 4, causes the appearance, on turning the disc, of the announcement for train No. 4. At night an incandescent electric lamp in the lower part of the box illuminates the placards very effectually.

The distinguishing features of this indicator are the facility with which changes can be made when a new time table is issued, and the complete enclosure of the placards, making it easy to keep them clean. Each train (as, for instance, "Express for Harrisburg, Pittsburgh and Chicago") can be described as fully as may be desired, the window in the case being about 15 × 20 in., and on any change in the character, destination or stopping places of the train, a new placard can be made (painted) and quickly inserted in its place. The whole apparatus being inside the box none of the lettered surfaces need be touched by the hand of the person in charge. A large surface being available for each announcement (each train), any desired variety of style or size of lettering may be made use of.

Electric Lighting in Odessa Harbor.

The electric lighting installation for the harbor of Odessa, in Russia, is briefly described in the *Industrie-Zeitung*, of Riga. The plant was completed last spring, the contract for the work having been awarded to the Thomson-Houston Co., of Boston, at the price of 83,044 roubles, with the proviso that the company should operate the plant for a term of five years, for 470 roubles a month and 7 kopecks an hour for each arc light. The installation was prompted by the importance of facilitating the wheat shipments in the autumn months when a large share of the work of loading the vessels is done at night to save time, and it was calculated that by the introduction of the electric light for this purpose an important advantage could be secured.

The harbor district extends over a length of 4 versts, for the proper lighting of which two underground circuits were arranged. In each of these there are 35 arc lamps connected in series, and each circuit has its own dynamo. In addition there are two reserve dynamos. The two steam engines, one of which suffices for the work, have a combined indicated horse-power of 140. A current of 40 ampères is used.

Besides the fixed lamps, which are placed at an average distance apart of 40 fathoms, there are a number of portable lights for lighting the holds of vessels. The ends of the two breakwaters in the harbor are each lighted by 10 incandescent lamps of 50 candle-power each, mounted on light iron towers, the current being transmitted by submarine cables, making, it is stated, the first lighting installation of this kind in existence.

Solid Bridge Floors.

The bridge being built by the Adirondack & St. Lawrence Railroad at Trenton Falls, N. Y., will probably have, when finished, the longest span of ballasted floor yet constructed. The bridge is being built, by the new railroad, over West Canada Creek. It is intended to have all the bridge floors on this line built in this way, except on the necessary trestles, which will all be ultimately filled in. A noteworthy departure in open culvert and cattle pass construction is that the opening is spanned by short lengths of old rails cut to suit, and laid close together at about sub-grade, thus forming a solid floor, on which the ballast is laid and prevented from spilling over by a light parapet of masonry laid up at each end of the rail floor. In this way another very numerous and objectionable class of openings is done away with.

Hanover Electric Station.

The Hanover, Germany, electric station, which was given over to service in March of last year, is one of the largest of its kind. It is owned by the city, but it serves only for private, and not public, illumination. It has a capacity of 18,000 incandescent lamps of 16 candle-power each. The system of mains, designed for 20,000 lamps, has an extent of 80 kilometers, or about 50 miles. One of the features of the plant is the simultaneous use, with the direct current from the station, of storage batteries which thus serve the purpose of auxiliary current reservoirs and make reserve dynamos, engines and boilers unnecessary. Sufficient storage batteries are provided to enable them to supply the whole estimated demand for electricity for a short time.

Mœnchenstein Bridge.

The contract for the new bridge to take the place of the collapsed bridge at Mönchenstein, Switzerland, of which accident several accounts have been given in *The Railroad Gazette*, has recently been awarded by the Jura-Simplon Railroad Co. to Messrs. Theodor Bell & Co., of Kriens. The new bridge is to be built according to designs by the contractors, and is to be finished and ready for traffic by June 1, 1892.

M. C. B. Association.

The Master Car Builders' Committee on Joint Inspection and Interpretation of Rules has sent out a long circular asking for opinions on various sections of Rules 3, 4, 6 and 8. There are 23 separate questions asked, and the circular will give members a good deal to think over. Those who wish copies of it should address the Chairman, A. M. Waitt, Assistant General M. C. B., L. S. & M. S. Ry., Cleveland, O.

Rapid Transit Plans.

In speaking last week of the plan presented in the New York *Sun* for a rapid transit line from the Harlem down to the Grand Central station, and thence to City Hall, we should have mentioned the fact that the idea of an arched viaduct with warehouses below is not new. Such a plan was presented to Mayor Hewitt' Sept. 5, 1887, by Mr. Walter Katté, Chief Engineer of the New York Central & Hudson River Railroad, and has been proposed by several others.

The Schoen Pressed Steel Brake Beam Company has much encouraged by recent orders. There are now on the books requisitions for 5,000 cars.

Compound Locomotives.

The Dean compound on the Lehigh Valley road has been put into service, and it is reported that it is doing very well.

New Works of the Bucyrus Steam Shovel Co.

The Bucyrus Steam Shovel & Dredge Co. is preparing to remove its works and business from Bucyrus, O., to Milwaukee, Wis., and will probably be established at its new location about July 1. Sixteen acres of land have been purchased in Milwaukee, 13 acres being on the uplands located on the Chicago & Northwestern, and the remaining two are on Oak Creek, near Lake Michigan. Most of the buildings will be located on the upland tract, and the Oak Creek location will be used for ship building purposes and for building dredge hulls and scows, tugs, yachts and other small boats. The new plant will double the present capacity of the Bucyrus Works. Special attention will be given to the lighting, heating and ventilation of the new buildings. Electricity will be used to a large extent for power, and a combination system of arc and incandescent light will be used for lighting the shops. Electric motors will be largely used for various purposes.

The Illinois Steel Co.

At the annual meeting, the following directors were elected: Nathaniel Thayer, Francis Bartlett, Boston; Morgan Roach, New Bedford, Mass.; A. J. Forbes-Leith, New York; Marshall Field, Norman Williams, R. Forsyth, H. S. Smith, W. R. Stirling, Jay C. Morse and H. H. Porter of Chicago. R. Forsyth takes the place of O. W. Potter, who declined re-election. The Directors elected the following officers: President, Jay C. Morse; Vice-Presidents, W. R. Stirling and H. S. Smith; Secretary, H. A. Gray; Treasurer, J. C. Stirling. The annual report showed net profits of $1,038,777, against $2,578,089 in 1890. The profits last year were equal to 5.57 on the outstanding capital. The total amount of receipts of raw material in the year was 3,026,455 tons; shipped, 705,362 tons of finished product; paid in wages during the year, $5,006,511; average number of men employed, 7,119. It is recommended that the open-hearth steel plant and plate mill authorized in 1889 be constructed without delay.

THE SCRAP HEAP.

Notes.

Another one of the Glendale (Mo.) train robbers has been caught at San Francisco.

On Feb. 8 the Empire State Express ran from Albany to near Syracuse, 147 miles, in 150 minutes, including a 5 minute stop at Utica.

A coroner's jury in the case of the locomotive boiler explosion at St. Clair, Pa., by which five men were killed, has rendered a verdict fixing the responsibility on the Philadelphia & Reading Railroad Co.

The Chicago, St. Paul, Minneapolis & Omaha has increased the weight of its standard rail from 65 to 72 lbs. to the yard, and has placed an order for 10,000 tons with the Illinois Steel Co.

The passenger trainmen on the Pittsburgh Division of the Pittsburgh, Cincinnati, Chicago & St. Louis have been directed to state, in announcing the name of a station, on which side of the train the platform is located.

The working time at the Altoona shops of the Pennsylvania road has been reduced to nine hours a day. A similar reduction has been made at some of the shops on the Erie, and at Meadville, Pa., the shops have been closed for a short time. The Alabama Great Southern shops at Birmingham, which have been run on eight hours' time for several weeks, will resume the 10-hour schedule.

On Tuesday of this week two boiler riveters were killed at the Baldwin Locomotive Works, Philadelphia, by an explosion of benzine inside a dome in which they were at work. They had used benzine to aid them in removing bolts which had become corroded, and it appears that a considerable quantity of it evaporated during their absence at dinner. On their return the gas was ignited by the workmen's lamp.

The people of Philadelphia, who seem to live under a constant feeling of irritation because their city is on a branch railroad, have lately renewed their complaint that the Congressional Limited express of the Pennsylvania Railroad between New York and Washington does not stop at or near their city, and the company has agreed to stop the trains. But the concession is unsatisfactory after all, because the stop is made at South street, which is on the west side of the Schuylkill, some distance south of the line leading from Broad street; passengers will have to go to and from there on a local train.

It appears that the officers of the Columbian Exposition, together with some of the Chicago railroad men, have taken steps to interfere with the schemes of the companies which have been organized to conduct individuals or parties from distant points to Chicago in 1893. The main feature of these companies is to receive money on the installment plan, giving the subscriber in return a certificate entitling him not only to railroad fares, but to hotel accommodations, etc. There are already 20 or more of these concerns and it appears that some of them are irresponsible. The state officers of New Hampshire have protested against business of this kind being done in that state without the sanction of law. One of the companies, however, has come out in a lengthy defence, claiming that its aims and methods are strictly legitimate. The argument of the railroads was that people would probably spend through these schemes more for the same benefits than if they paid their expenses in the ordinary way, but the convincing answer of the "chaperone" manager is that most of his customers would not have the gumption to save the necessary money to take them to the World's Fair if they were not under a contract imposing a penalty upon them in case of failure to lay aside the necessary amounts with regularity.

Foreign Notes.

Finland's official railroad statistics for 1890 place the total length of railroads in the country under government control at the end of that year at 1875.6 kilometres, with 19.6 kilometres of double track. The invested capital amounted to 143,158,508 francs, representing 76,351 francs per kilometre, or about $25,450 per mile of road. During the year in question there were in use 151 locomotives and 370 passenger and 3,594 freight cars; 2,541,642 passengers and 955,913 tons of freight were carried. The net receipts amounted to 3.31 per cent of the capital invested.

According to an order recently issued by the Prussian Minister of Public Works, tending to secure a maximum of useful effect from the locomotives on the different lines of railroad, there is to be a general increase in the length of freight trains, and the short trains, hitherto made up for the sake of temporary convenience, are to be discontinued. On level sections the number of car axles in a train is to be raised from 120 to 150; on sections with heavy grades, however, the number will be subject to discretionary measures.

According to an note on the railroads of the Island of Ceylon, given in the *Journal des Transports*, the total length of the whole system on December 31, 1890, was 308 kilometres, showing an increase of 17 kilometres over the figure for the preceding year. The receipts represented 12.18 per cent. of the invested capital, and the expenditures amounted to 44.6 per cent. of the receipts; freight to the amount of 228,998 tons and 2,708,719 passengers were carried during the year.

The Indian Government has sanctioned the construction by a native company of a railroad about 30 miles long in the Hooghly district. This will be the first railroad in India built and controlled entirely by natives.

Spanish American Notes.

The recent trouble in Pelotas, Rio Grande do Sul, Brazil, which was taken by some as an indication of a continuance of the revolutionary spirit in that country, was simply a local uprising against the governor on account of grants for monopolies in certain branches of manufacture.

New water-works have just been completed in the city of Nictheroy, the capital of the State of Rio de Janeiro, Brazil.

The Sao Paulo Railroad Co., of Brazil, some time ago made a formal protest against the granting of a concession to the Mogyana Railroad Co. to build a double track road from Santos to Campinas. The protest was returned to the company as wanting in dignity. Considering that the Mogyana Railroad is undertaking so many improvements and additions to its line, and considering also that most of its former equipment, although ordered in England, was specified in conformity with American designs, would it not be well for American firms to secure the orders for the new equipment which will now be needed?

The following table shows the distribution of trade with Uruguay for 1890, according to the Uruguayan statistical report:

	Imports, per cent.	Exports, per cent.
United States	6.9	7.6
Great Britain	13.6	27.2
France	21	15.7
Germany	3.5	8.7
Brazil	14.3	7.6
Belgium	10.8	4.6
Various countries	32.9	28.6

Argentine immigration statistics for 1891 show 73,597 arrivals and 90,976 departures. Many of the emigrants from Argentine went to Uruguay and Paraguay. It is evident that immigrants to Uruguay have also met with disappointments, since out of 208,500 who entered during the last four years, 241,000 have already migrated to other lands. The present population of Uruguay amounts to 706,500, an increase of 61 per cent. in 11 years.

The financial depression in Argentine has apparently exerted little effect upon railroad construction, 1,208 miles of road having been opened to traffic there during the year 1891 and contracts having been signed for the construction of nine new lines.

The Argentine government has paid in guaranteed interest upon railroads $15,440,000 up to the present time.

A railroad map of the Argentine Republic is being drawn up by Engineer Chavanne, under contract with the government, for distribution in this country and Europe.

The railroads in Argentine are still suffering from a decrease in traffic, but it is hoped that after the elections, when the country is again quiet, aided by the ability of people in the interior to buy for cash as a result of the recent remarkable crops, there will be a revival of trade. It is noticeable that the movement of freight from the interior toward tide-water has shown no appreciable diminution, the decrease being almost exclusively in imported goods.

Deposits of coal have been discovered in the territory of Patagonia, Argentine, and Mr. W. Corrales has applied for the purchase of 22 leagues of state lands in the coal district, with permission to construct tramways and other works needful for beneficiating the deposits.

The total cost of the late Chilian civil war, exclusive of property destroyed and commercial losses, is estimated at $85,000,000, of which over three-fourths was expended by Balmaceda.

The government of British Honduras has entered into a contract with Mr. R. W. Starkey to make surveys for a railroad from Belize through the district of Cayo to the town of Peten on the Guatemalan frontier, but there is no intention of contributing any advantage to the latter country, as will appear from the following extract from the instructions of the government: "(the road) to be laid out near the frontier of Guatemala as to be incapable of extension or of a railway being made from the termination to the City of Guatemala." Sir Douglas Fox, C. E., will have supervision of the survey.

Securities Listed at the New York Stock Exchange.

The New York Stock Exchange has added to the lists for dealings railroad securities as follows:

Cleveland, Cincinnati, Chicago & St. Louis.—$842,000 additional general first mortgage 4 per cent. gold bonds, making total amount listed $7,430,000.

Chicago & Indiana Coal.—$185,000 additional first mortgage 5 per cent. currency bonds, making the total amount listed $4,587,000.

Chicago & Eastern Illinois.—$1,243,000 additional general consol and first mortgage bonds, making the total amount listed $5,440,000.

Grand Rapids & Indiana.—$1,000,000 extended 4½ per cent. first mortgage bonds of 1941.

Ohio & Mississippi.—$120,000 additional first general mortgage 5 per cent. bonds, making the total amount listed $4,006,000.

Philadelphia & Reading.—$1,078,000 additional general mortgage 4 per cent. bonds, making the total amount listed $36,781,000.

St. Louis & San Francisco.—$11,610,000 consolidated mortgage 4 per cent. bonds of 1990.

Savannah, Americus & Montgomery.—$300,000 additional first mortgage 6 per cent. bonds, making the total amount listed $3,230,000.

The Best Blast Furnace Record.

The output of the "I" furnace of the Edgar Thomson plant at Braddock, Pa., for January last was 12,706 tons of 2,240 lbs. each, or an average of nearly 410 tons per day. The best week's output was 3,005 gross tons, and the best day's work was 511 tons. Previous to this the test work had been done by furnace F of this plant, which made a record of slightly over 11,000 tons for a month's work, with 506 tons for the maximum day's output.

Russian Famine Relief.

The Atlantic Transport Line steamer "Missouri" has been offered to W. C. Edgar, Manager of *The Northwestern Miller*, to carry the 2,000 tons of food which have been collected for the famine-stricken peasants of Russia. Thomas Hogan & Sons, stevedores, applied for permission to load the ship at their own expense; the Berwind-White Coal Mining Company, of New York, have offered to coal the ship for her trip; the New York warehouses will store the supplies until ready for shipment; no wharfage charges will be made; the New York Central Railroad will collect the food and deliver it in New York, and the underwriters are now consulting whether they can insure it without cost. The 2,000 tons of flour will not much more than half fill the "Missouri," as she has a carrying capacity of 3,500 tons. All that may be received up to the time she sails, in addition to that already on hand, will be sent over in her.

Rails in Tunnels.

From a note in the *Zeitschrift* of the Austrian Engineers' and Architects' Society it appears that the corrosion of the rails and their accessories in the Altenburg tunnel necessitated a complete renewal of both tracks after a period of 11 years. The rust-films, so-called, varied in thickness from 4 to 6 mm., and consisted, in the main, of a sulphur compound. Corrosion seemed to have attacked particularly the webs of the rails. The thickness of 10 heads had become decreased by about 10 mm. (0.4 in.) in the tunnel as compared with a reduction of 5 mm. (0.2 in.) on the open sections. Similar observations were made on the fish plates, bolts and spikes. Near the tunnel entrances the degree of corrosion was more pronounced than further in the interior, and the results were ascribed to the action of sulphuric acid produced from the smoke of the locomotives. As a probable remedy, a coating of rich coal tar has been applied to much of the metal work, and is to be renewed at half-yearly intervals, and the roadbed gravel has been mixed with crushed limestone. It has, however, not yet been possible to ascertain what effect these measures are likely to have.

The Grand Jury on the Hastings Accident.

On Feb. 10 the grand jury presented indictments against Albert E Herrick for manslaughter in the second degree. Herrick was the flagman of the New York Central train which was wrecked at Hastings. The circumstances are still too fresh to need rehearsal. At the same time the grand jury censured the New York Central & Hudson River Railroad for careless and negligent management. It is said that there was a blockade on both tracks at Sing-Sing which prevented trains from passing either north or south, and while the disaster that occurred might have been prevented had Herrick performed his duty, still the company should have caused some second man to go back with or after him. The company is also censured for having sent out trains from the Grand Central Station while the blockade at Sing-Sing existed without giving the conductors and engineers any notice of the blockade. Also for not instructing employés to allow trains stopped by semaphore signals to pass under the protection of such signals as soon as a sufficient length of track had been cleared. And the company is further censured for not using the block system. C. C. Delanoy, stationmaster at Hastings, is censured for having done nothing to make sure that Herrick did his duty in protecting his train.

A Recent English Derailment.

Major-General Hutchinson's report on the derailment upon the South Eastern Railway, near Cannon street station, London, is practically a condemnation of that company's practice of running trains made up of 40-year-old stock and the modern long 12-wheel cars mixed together promiscuously. The accident occurred on Jan. 7 and closely followed a similar one on Dec. 18.

It appears that the Hastings express, made up of engine, tender and nine cars, left the rails near the facing points of the up line to Charing Cross. An examination of the line showed no faults beyond the fracture of four chairs by the derailment. Nor could the accident be attributed to the pointsman, for the first part of the train passed safely and there was a locking bar which must have prevented any further movement of the switch until the train passed. Though the curve is sharp there are 153 daily trains passing this point and there has been no accident for 20 years. The curve is of 495 ft. radius at the sharpest point and it would of course be better if flatter. The accident was not due to this *per se*, but to the fact that a 26½ ton long car followed an old and light six-wheeled carriage and on checking the forward portion of the train this light vehicle was pushed off and obliquely across the line. The mistake in such working is obvious, for the vehicles have side buffers instead of central, and a short and light carriage can scarcely fail upon a sharp curve to be pushed off the line by the heavy one-sided pressure of a long vehicle behind.

Those who know the South Eastern Railway know that the bulk of its trains are made up of samples of many periods. The company still owns and runs some of its original stock or at least stock of a pattern only built 40 or 50 years ago. All buffers are side, not central, and to run a train like this is little short of criminal, in the face of past experience, on a falling gradient, as it was at the site of the accident, of 34½ ft. per mile. The light vehicle was nipped front and rear between the long cars upon a sharp curve and could scarcely fail to be thrown off the road.

The secretary of the company had the effrontery at the inquest to throw a doubt upon the explanation, a course which will not tend to improve the reputation of the company. The most impertinent item of all was, however, a speech by the chairman of the company, Sir Edward Watkin, who said that the third class carriage which was derailed and overturned was filled with "respectable people who could well afford to travel first class;" the inference being that it served them right for traveling third, that third-class passengers were not respectable and that the company did not care if third-class passengers were injured.

Coupler Legislation.

The Washington meeting of the late railroad commissioners' committee on safety appliances opened with spirit. One ex-commissioner even wanted another ex-commissioner to name a date and place for equating with sticks, or other arms, their ideas of the best way of saving life and limb. Tramps and trainmen sometimes use coupling pins for such settlements, and we suggest these as especially appropriate weapons for the ex-commissioners.

Height of Buildings in Chicago.

The city council of Chicago has decided to limit the height of new buildings in that city to 150 ft. in the future, and then only when fronting on streets at least 80 ft. wide.

LOCOMOTIVE BUILDING.

The Brooks Locomotive Works is to build 20 ten-wheel engines for the Atchison, Topeka & Santa Fe. These engines are to be the road's standard type, 18 × 24 cylinders, to carry 180 lbs. pressure, and to be equipped with the American driver brake.

We announced in December that the Pennsylvania will probably build 250 engines this year for the lines east of Pittsburgh and 130 for the western system. A recent item in a local newspaper says that it has been decided to build 34 freight and 17 passenger engines for the Panhandle division. The Columbus shops will build 25 class R freight engines and the Altoona shops the remaining nine. The Fort Wayne shops will build 10 Class X passenger engines, and the remaining seven passenger engines will be built at Altoona, Class O pattern.

CAR BUILDING.

The Louisville, New Albany & Chicago has ordered 300 box cars from the Ohio Falls Car Co.

The Burlington, Cedar Rapids & Northern has ordered 100 platform cars from the Peninsular Car Co.

The St. Charles Car Co. has orders to build 10 day passenger and 5 baggage cars for the St. Louis & San Francisco and the Missouri Car & Foundry Co. will build 500 box cars. These are additional to the Atchison orders.

Sixty-one passenger, five baggage and three postal cars are said to have been ordered for the Southwest System of the Pennsylvania, all to be built at the shops at Columbus, O.

The New York Central & Hudson River road has given out orders this week to Murray, Dougal & Co., of Milton, Pa., to build 1,000 gondola cars and to the Michigan Car Co., of Detroit, 1,000 box cars, and to the Buffalo Car Co. for 900 box cars.

The Atchison, Topeka & Santa Fe has recently ordered a large number of cars from the Barney & Smith Mfg. Co. and the Missouri Car & Foundry Co., for delivery in March, April and May. The orders include 2,000 box, 500 platform, 500 stock and 250 refrigerator cars, 15 cabooses, 35 chair cars, 10 ordinary passenger and 8 baggage cars. The cars will have the Westinghouse brake and Safford drawbar.

BRIDGE BUILDING.

Black River Falls, Wis.—The Chicago, St. Paul, Minneapolis & Omaha has just completed a two-span iron bridge 330 ft. in length over the Black River. The Lassig Bridge & Iron Works were the builders.

Chippewa Falls, Wis.—The Lassig Bridge & Iron Works, of Chicago, are building an 850-ft. six-span iron bridge across the Chippewa River for the Chicago, St. Paul, Minneapolis & Omaha.

Colville, Wash.—A county bridge, 800 ft. in length, has been erected over the Colville River, west of the town of Colville, Wash.

Essex County, Ont.—The county commissioners are asking for tenders for the construction of a bridge at Canard River, Essex County, Ontario.

Los Angeles, Cal.—The Southern Pacific will erect a new two-span iron bridge 320 ft. long over the Los Angeles River at Los Angeles. It is being manufactured in the East.

Marietta, O.—Work has been resumed on the new draw span of the city bridge at Marietta after having been stopped a few days on account of an objection on the part of the Government engineers. The Columbus (Ohio) Bridge Co., which is building the new draw span, promises to have it completed in two more weeks. The bridge spans the Muskingum River, is used for highway purposes, has a draw span 195½ ft. in length, an 18-ft. roadway, 5-ft. sidewalks, and the contract price for the span is $9,990.

Miniota, Manitoba.—The municipality is advertising for tenders for the construction of a bridge to be built across the Assiniboine River. Plans and specifications may be seen at the Department of Public Works, Winnipeg.

Nashville, Tenn.—The Youngstown Bridge Co., of Youngstown, O., has been awarded a contract at $6,000 for constructing an iron bridge 35 × 26 ft. over the crossing of the Nashville & Chattanooga Railroad, at Cherry street, South Nashville.

New Brunswick, N. J.—The Board of Freeholders of Middlesex County, have under consideration six plans for a new stone arch-bridge across the Raritan River at New Brunswick. The structure will cost about $200,000. The present bridge is in an unsafe condition. The Freeholders have made no decision on what plan they will adopt.

Perth, Ont.—The bridge at Perth has been at last completed and the draw was swung for the first time last week.

St. Boniface, Man.—The council of the town has voted to grant a $40,000 bonus to the Norwood Company to build a new permanent bridge over the Winnipeg River, thus settling a matter which has been the subject of much contention in the town for some time.

Wolfe Island, N. Y.—The bill authorizing the incorporation of a company, with $2,000,000 capital, to build a bridge across the St. Lawrence River at Wolfe Island, passed the New York Legislature this week. This island lies at the point where the river flows out of Lake Ontario. The object of building the bridge is thought to be to connect the railroad systems of the Canadian Pacific and the New York Central.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Maine, semi-annual, $3.00 per share on the preferred stock, payable March 1.

North Pennsylvania, quarterly, 2 per cent., payable Feb. 25.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Atlanta & Charlotte, air line, general, New York City, N. Y., March 9.

Brooklyn Elevated, annual, adjourned, 31 Sands street, Brooklyn, N. Y., Feb. 20.

Camden & Atlantic, annual, Cooper Point, Camden, N. J., Feb. 25.

Chesapeake & Ohio, annual, Richmond, Va., Feb. 23.

Chicago Junction Railways & Union Stock Yards Co., special, New York, N. Y., March 1.

Chippewa Valley, annual, Mount Pleasant, Mich., Feb. 17.

Delaware, Lackawanna & Western, annual, 22 William street, New York City, Feb. 23.

Fort Worth & Denver City, annual, Fort Worth, Tex., March 1.

Grand Rapids & Indiana, annual, Grand Rapids, Mich., March 2.

Herkimer, Newport & Poland, annual, New York City, March 1.

Malone & St. Lawrence, annual, New York City, March 1.

Missouri Pacific, annual, St. Louis, Mo., March 8.

Mohawk & Adirondack, annual, New York City, March 1.

New York, Lackawanna & Western, annual, New York, N. Y., Feb. 23.

New York, Susquehanna & Western, annual, Jersey City, N. J., Feb. 25.

Norfolk & Southern, annual, Norfolk, Va., March 3.

Northern Central, annual, Baltimore, Md., Feb. 25.

Oregon Short Line & Utah Northern, annual, Salt Lake City, Utah, March 16.

Pennsylvania, annual, Philadelphia, Pa., March 8.

St. Lawrence & Adirondack, annual, New York City, March 1.

St. Louis, Iron Mountain & Southern, annual, St. Louis, Mo., March 8.

West Virginia Central, annual, Philadelphia, Pa., Feb. 23.

Wichita Valley, annual, Wichita Falls, Tex., March 8.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Railway Freight Claim Association of the Eastern, Western and Southern States* will hold its regular semi-annual meeting at the Grand Pacific Hotel, Chicago, Ill., March 3.

The *New England Railroad Club* holds regular meetings, at the United State Hotel, Beach street, Boston, Mass., on the second Monday of each alternate month, commencing January.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings on the third Thursday in each month, at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The *Southern Railway Club* holds regular meetings on the third Thursday of the months of January, February, March, May, September and November at such points as are selected at each meeting.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 230 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The Tacoma Society of Civil Engineers and Architects holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

Engineering Association of the South.

A regular meeting of the Engineering Association of the South was held at the headquarters of the association at Nashville on Thursday evening, Feb. 11, Vice-President Jas. Geddes presiding.

The standing committees for the ensuing year were announced by the Board of Directors as follows: Committee on Finance, W. F. Foster, W. L. Dudley and John MacLeod; Committee on Rooms and Library, E. C. Lewis, Jas. Geddes and F. P. Clute; Committee on Papers and Printing, Olin H. Landreth, W. B. Ross, Chas. B. Percy, Hunter McDonald and John B. Atkinson. Applications for membership were received from E. B. Cushing, Resident Engineer Southern Pacific, Houston, Tex.; W. N. McDonald, Assistant Engineer N. C. & St. L. R. R., Nashville, Tenn., and A. H. Wood, Assistant Engineer T. C., I. & R. R. Co., Tracy City, Tenn.

The President of the Association, Mr. A. V. Gude, of Atlanta, sent a communication inviting the Association to hold the March meeting at Atlanta. The invitation was accepted, and a committee was appointed to make provisions for transportation. This committee subsequently reported that Maj. J. W. Thomas, President of the N. C. & St. L. R. R. had offered to furnish transportation to the members of the Association to the meeting at Atlanta, and would place a private car at their disposal. The trip will be made by daylight, in order to give the members of the Association an opportunity to inspect the extensive improvements being made on the Western & Atlantic Railroad, which has recently been acquired by the N. C. & St. L. R. R. Co.

A circular letter from the chairman of the General Committee of Engineering Societies, World's Columbian Exposition, was received. The matter was referred to a committee composed of Messrs. W. L. Dudley, J. S. Walker, Jas. Geddes and J. B. Atkinson to consider the matter, and make any desired recommendations to the Association at its next meeting.

The Committee on Highway Machinery Contest reported progress in the preparation of a detail scheme for carrying out the contest.

Prof. Olin H. Landreth then spoke on the subject of "The Calorific Power of Southern Coals." One of the results presented was that a series of coal tests covering a large number of Southern coals had developed the fact that there were at least three Southern coals which were superior in calorific power to the standard second pool Pittsburgh coal, and but slightly below Cumberland, Md., semi-bituminous coal. The paper was discussed by Messrs. Hunter McDonald, J. B. Atkinson, W. L. Dudley, J. S. Walker, W. G. Kirkpatrick and Gordon Hicks.

Engineers' Society of Western Pennsylvania.

At the meeting of Dec. 15 the committee appointed to nominate officers reported as follows: For President, A. E. Hunt; Secretary, R. N. Clark; Vice-Secretary, Cornelius Barnes; Treasurer, A. E. Frost.

The paper of the evening was on Bridge Details, by Mr. E. Swensson. This paper was discussed by several of the members present.

The Mining Engineers' Annual Meeting.

The faculty of Johns Hopkins University has arranged a programme of entertainment for the members of the American Institute of Mining Engineers, which began its twenty-second annual meeting in that city Feb. 16. At the opening session addresses were made by Mayor Latrobe, James W. Tyson, president of the local committee; President Gilman, of the Johns Hopkins University, and by the President of the Institute, John Birkinbine. George F. Kunz, of New York, read a paper on "Mining of Gems and Other Minerals in Hungaria, Bohemia and Russia." The university men prepared a handsome guidebook as a souvenir. The programme of entertainment includes a banquet, a visit to the Government ordnance proving grounds at Indian Head on the Potomac, and a harbor excursion.

PERSONAL.

—Mr. F. L. Parker, General Freight Agent of the Great Northern, resigned that position on the 15th inst.

—Mr. John Taylor, General Traffic Manager of the Lehigh Valley, has been appointed General Traffic Manager of the entire Philadelphia & Reading system.

—Mr. E. B. Wynn, General Counsel for the Rome, Watertown & Ogdensburg Railroad, died at his home in Watertown, N. Y., Feb. 16, after a month's illness.

—The wife of Mr. Thomas M. King, First Vice-President of the Baltimore & Ohio Railroad, died at her home at Germantown, near Philadelphia, last week, of cancer.

—Mr. A. J. Bandy, Assistant General Freight and Passenger Agent of the Ohio River Railroad, has resigned to accept a position with the Monongah Coal Coke Co., of West Virginia.

—Mr. P. A. Smith, Resident Engineer of the Texas & Pacific, died at Marshall, Tex., Feb. 7, from the result of injuries received in a wreck on the previous Saturday and which had necessitated the amputation of one of his legs.

—Mr. F. P. Boatman, formerly Superintendent of Motive Power of the Cleveland, Cincinnati, Chicago & St. Louis, has recently become connected with the Queen and Crescent System as Master Mechanic of the shops at Ludlow, Ky.

—Mr. John H. Morton, one of the engineers who located the Denver & Rio Grande in Colorado, and who has lately been with the Rio Grande Western locating new branches, died suddenly last week in Denver after a very brief illness. Mr. Morton was about 45 years old.

—Mr. C. Kadona, a young Japanese nobleman, has become a member of the corps of Pennsylvania Railroad engineers at Phillipsburg, Pa. He is a graduate of the Government University at Tokio and is in this country for the purpose of acquainting himself with American railroad practice.

—Mr. Albert Fink is quoted as refusing absolutely to re-enter railroad service, having declined the Presidency of the reorganized Richmond Terminal system, which he has been urged to accept. Mr. Fink has been living at his old home in Louisville since his resignation from the Trunk Line Association in 1889.

—Mr. E. F. Drake, of St. Paul, who some years ago was a prominent railroad builder in the West, died at Coronado Beach, Cal., Feb. 15, aged 78 years. He built the 10 miles of road between St. Paul and Stanton in 1860, probably the first railroad built in Minnesota. He also built several lines in Iowa now included in the Chicago & Northwestern system, and had previously been engaged in railroad building in Ohio and Illinois.

—Mr. Albert Rokusek, General Passenger Agent of the Cleveland & Canton, has resigned that position, to take effect April 1, when he will become connected with a mercantile company. He was formerly both General Freight and Passenger Agent of the line before the two departments were separated. He was appointed Chief Clerk of the freight and passenger department in 1884, having previously been Secretary for the General Manager, and he became Assistant General Freight and Passenger Agent in March, 1884.

—Mr. Alfred Walter, General Superintendent of the Baltimore & Ohio lines east of the Ohio River, has resigned that position, having been appointed General Manager of the New York, Lake Erie & Western Railroad. He will come to New York probably about March 1. Mr. Walter has been with the Baltimore & Ohio since August, 1889, when he succeeded Mr. William M. Clements as General Superintendent west of the Ohio River. Mr. Walter was Division Superintendent on the Pennsylvania Railroad for seven years, and was in the service of that road altogether about 17 years, all of that time in the engineering department except the superintendency and about nine months in 1882, when he was assistant engineer of the motive power department.

—Mr. Azariah B. Harris, President of several New England roads, died suddenly in New York City, early last week. He was 39 years old and the son of the late Daniel L. Harris, of Springfield, Mass., who had been President of the Connecticut River Railroad for a quarter of a century. Mr. A. B. Harris was graduated from Harvard in 1876 and was appointed almost immediately to several important railroad positions, first as president of the Ashuelot Railroad. He was at different time President of the Vermont Valley and also of the Ogdensbury & Lake Champlain. At the time of his death he was president of the Sullivan County, Vermont Valley and Connecticut & Passumpsic River roads, a director of the Connecticut River and President of the Massachusetts & Southern Construction Co., which is building the Charleston, Cincinnati & Chicago Railroad.

—The death of Vice-President Edward M. Reed of the New York, New Haven & Hartford occurred at New Haven, Conn., Feb. 13. He has been in failing health for over a year. Mr. Reed was born in Lancaster County, Pa., in 1821. He was a mechanic, went early into foundry work, and in 1843 began railroading, and was a locomotive engineer. He was engaged upon several roads, part of the time in Cuba, and became Master Mechanic of the New Haven, Hartford & Springfield road in 1848. From Master Mechanic he became Superintendent of the road in 1872, and at the consolidation in 1872 of the New York, & New Haven and the New Haven, Hartford & Springfield roads, he was made General Superintendent of the whole road and removed his home to New Haven. He has been a director and Vice-President since 1874. At a special meeting of the Directors on Saturday, resolutions of respect to Mr. Reed's memory were adopted and the board voted to attend the funeral in a body.

—Dr. Thomas Sterry Hunt, one of the foremost of our scientific scholars, especially in the domains of chemistry, mineralogy and geology, died at the Park Avenue Hotel, in New York, on the 12th inst., of mitral disease of the heart, from which he had been a great sufferer during the past three years.

Dr. Hunt was born in Norwich, Conn., Sept. 5, 1826; pursued the study of chemistry with the Professors Silliman, at Yale, and for some time was an assistant of the elder in his laboratory. About 1850 he was appointed chemist and mineralogist of the Geological Survey of Canada, residing in Montreal, where the splendid generalizations concerning the primitive rocks of this continent, which have distinguished the Canadian survey, were matured and promulgated. In this work he was associated with Sir William Logan, but the brilliant results were in great part due to Dr. Hunt's researches and genius. He was one of the founders of Laval University, in Quebec, and lectured there in French for about six years. He afterwards lectured in McGill University at Montreal for several years. In 1872 he was elected Professor of Geology in the Massachusetts Institute of Technology, and remained there also about six years. He then resumed connection with the Canadian Survey; but this left him time for scientific consultations and geological examinations. He was much interested in the opening of the Hocking Valley coal region, and was an associate in the perfection of the Hunt and Douglass process for the reduction of copper ores; indeed, he contributed largely to the practical money-making applications of science.

But his life's work was the establishment of chemistry and mineralogy upon modern bases, in harmony with the development in all the other sciences. In early life he attacked the old theories as artificial and unnatural, and the files of the scientific journals will be found to contain numerous contributions from him, from 1850 to 1880. Many of these papers were revised and reprinted under the title, "Chemical and Geological Essays," in 1880; and in the same year, "Mineral Physiology and Physiography," and "A New Basis for Chemistry" were revised. His last great work, completed under circumstances which showed immense resolution on the writer's part, has only just been issued from the press: "Systematic Mineralogy, Based on Natural Classification." Probably this is the greatest work upon this subject which has ever appeared.

Dr. Hunt was an officer of the Legion of Honor, a member of almost every scientific society of America and Europe, doctor of several universities, and enjoyed the acquaintance of the most eminent scientific men of his period. His linguistic accomplishments were extensive, and enabled him to hold profitable intercourse with foreigners. On the 15th inst. his remains were taken to his native place for burial.

ELECTIONS AND APPOINTMENTS.

Alleghany & Kinzua.—C. V. Merrick has been appointed Superintendent, with headquarters at Bradford, Pa., to succeed C. D. Williams, resigned. Mr. Merrick is Superintendent of the Bradford Division of the New York, Lake Erie & Western, but the road will continue to be operated as an independent line.

Atlantic Terminal.—The incorporators are Solon Humphrey, of Bergen Point, N. J.; Edward S. Man, of Bayonne, N. J.; George D. Murray, of Montclair, N. J.; Russell W. Woodward, of Elizabeth, Sidney Appleton, H. Seymour Gearey and H. C. Anderson, of New York City.

Augusta, Gibson & Sandersville.—At the meeting at Augusta, Feb. 10, the following directors were elected: J. H. Alexander, H. H. Hickman, W. J. Pollard, L. D. Matthews, J. L. Neal, David Denton, Jas. Stapleton, Macon Warthen, Charles H. Howard, George W. Stetson and A. E. Thornton. The directors elected Capt. William B. Young President of the road to succeed Major H. Wilkins, who is now the Receiver. R. W. Inman was elected Vice-President.

Baltimore & Ohio.—Alfred Walter having tendered his resignation as General Superintendent of the lines east of the Ohio River, to accept service with another company, the duties of that office will, until further notice, be performed by J. T. Odell, General Manager.

California & Nevada.—J. A. Williamson, formerly President of the Atlantic & Pacific, but at the present time Land Agent, has been elected President of this road. The other officers elected are as follows: A. A. Grant, Vice-President and General Manager; J. A. Burton, Secretary and Treasurer; Amos Beal, General Superintendent.

Central of New Jersey.—A circular was issued by President Maxwell on Feb. 12 announcing that the railroad had been transferred on that day to the Port Reading.

Chicago, St. Paul & Kansas City.—J. S. Winnett, General Agent at Pittsburgh, has been appointed Assistant General Freight Agent, with headquarters at Des Moines, Ia. He had been general agent at Pittsburgh for the last two years and a half.

Denver & Rio Grande.—E. M. Horton has been appointed Car Accountant of this company with office at Denver, Colo., vice T. T. Speer, assigned to other duties.

Joliet, De Kalb & Northern.—The following are the incorporators of this Illinois company: W. L. Elwood, of DeKalb, Ill.; E. W. Paxton, Edgar Henning and George Carver, of Plano, Ill., and W. W. McDowell, of Chicago.

Kentucky & Indiana Bridge Co.—A. V. Lafayette, late Division Freight Agent of the Louisville Southern, has been appointed General Freight and Passenger Agent of the Kentucky & Indiana Bridge Co. The appointment will take effect March 1.

Little Rock, Sh idan & Saline River.—The officers and directors are: William Farrell, Little Rock, Ark., President; R. E. Farrell, Hensley, Ark., Vice-President; Omer Farrell, Chicago; W. E. Farrell and Elizabeth Farrell, Arkansas.

New England Car Co.—C. J. Fellows, formerly Car Accountant of the Cleveland, Cincinnati, Chicago & St. Louis, has been appointed Superintendent of this company, vice L. D. Voat, with headquarters at Chicago.

New Orleans Public Belt.—At the annual election of trustees last week the following board was elected: E. J. Hart, J. Ward Gurley, Jr., Hugh Flynn, F. J. Levis, J. E. Auvray, David Zable, A. B. Booth, G. G. Friedericks, John R. Conway, Alden McLellan, Louis Grunewald, Louis Bush, O. Elmer, W. M. Levy, J. A. Mercier, P. M. Schneidau, N. D. McDonald, J. R. Hoening, Jr., Wm. H. Chaffe, P. L. Fourchy, C. L. Walker, H. R. Gogreve, A. A. Woods.

Newport News & Mississippi Valley Co.—The headquarters of M. B. Cutter, General Superintendent, formerly, at Louisville, Ky., are now at Memphis, Tenn., to which point they were removed on the appointment of Mr. Cutter to be General Superintendent of the Louisville, New Orleans & Texas.

New York Central & Hudson River.—The headquarters of Clinton L. Rossiter, Assistant Superintendent Western Division, have been removed from Syracuse to Buffalo, N. Y., and he has been placed in charge of passenger conductors, engineers and trainmen. Henry Gould, Assistant Superintendent, with headquarters at Rochester, N. Y., will have charge of freight train men.

Northern Pacific.—J. M. Bunker has been appointed Superintendent of the James River Division, with headquarters at Aberdeen, S. D.

Portland & Willamette Valley.—R. Koehler, Manager of the Southern Pacific lines in Oregon, has been appointed Receiver of this road in a suit brought by the Pacific Improvement Co.

Port Reading.—This company assumed possession of the property of the Central Railroad of New Jersey on Feb. 12, J. Rogers Maxwell, President of that road, having been appointed Vice-President of the Port Reading in charge of the operation of the line.

Poughkeepsie Bridge System.—James K. O. Sherwood, of Philadelphia, has been appointed receiver of the Poughkeepsie Bridge Company and of the Central New England & Western Railroad.

Santa Fe Southern.—The annual meeting of the stockholders took place at Santa Fe, N. Mex., Feb. 17, resulting in the election of the following directors: S. F. Sullivan, C. H. Eichs, C. A. Bramley, D. R. Chilton, E. R. Leland, New York; Thomas B. Baldron and John Symington, of Santa Fe. L. M. Meily, President and General Manager, retires, and the new officers are E. R. Chapman, of New York, President; T. B. Calron, of Santa Fe, Vice-President. Superintendent T. J. Helm assumes the general management.

Summit Branch.—At the annual meeting of the company last week the following directors were elected: George B. Roberts; A. J. Cassatt, Henry D. Welsh, N. P. Shortridge, J. N. Du Barry, John P. Green, I. J. Wistar, William J. Howard, William H. West, George F. Swift and Amos R. Little.

Texas & Pacific.—N. G. Pearsall, Division Superintendent, has removed his headquarters from Marshall, Tex., to New Orleans.

Wheeling & Lake Erie.—A. H. Thorp has been appointed Assistant Treasurer of the company.

RAILROAD CONSTRUCTION,

Incorporations, Surveys, Etc.

Adirondack & St. Lawrence.—The total length of main line now under construction from Herkimer, N. Y., to Malone, N. Y., is 174 miles. Of this, 45 miles has the track laid ready for ballasting, 72 miles are graded and ready for the rails, and of the remaining 57 miles, which is all under contract, all but nine miles is actually being worked, notwithstanding the present severity of the weather. The large bridge at Trenton Falls is ready for the superstructure. The line from Malone to Valleyfield, P. Q., which will eventually be a part of this road, is being temporari y operated by the Canada Atlantic. It has trackage rights over the Canada Atlantic from Valleyfield, across the Coteau Bridge, to Montreal, and to St Polycarp, where a connection is made with the Canadian Pacific, so that with the opening of this road between Herkimer and Malone there will be through connections from New York to Montreal, and to points on the Canada Atlantic, the Grand Trunk and the Canadian Pacific systems.

Alabama & Mississippi.—Articles of incorporation have been filed with the Secretary of State in Alabama. The incorporators are from Columbus, Miss., and Pickensville, Ala. The proposed road is to run from Pickensville, in Pickens County, in a northwesterly direction to the Mississippi State line, where it will connect with a road to Columbus. The capital stock of the company is $10,000.

Albany Terminal.—The New York Central & Hudson River road has agreed to lease and operate the Albany Terminal line as soon as it is constructed. This road is intended to give access to the lumber district and the northern water front of Albany, N. Y., besides storage warehouses that are to be built by the Terminal Company. The Common Council has granted the franchise for constructing the road from the river front to a point opposite Tivoli Lake Reservoir, where the connection with the New York Central is to be made. W. B. Van Rensselaer is the attorney of the new company.

Arkansas City, Oklahoma & Texas.—The charter of the company was filed in Kansas last week. It contemplates the construction of a road from Arkansas City, Kan., southwest through Oklahoma to Henrietta, Tex. The projectors propose to secure the right of way through Oklahoma, and then to ask the Atchison, Topeka & Santa Fe to construct the line.

Atlantic Coast Line.—The tracklaying on the extension to Rowland, S. C., near the state line, has been completed, the last rails having been laid Feb. 16. The branch is 43 miles long and begins at Fayetteville, N. C., extending southwest to the connection with the Florence branch running north from Pee Dee. The building of the branch shortens the route of the Atlantic Coast line between Savannah and Charleston to the north about 60 miles. The new line is one of the many branches that have been built in thelast few years by that system, materially shortening its line from Norfolk, Va., to Wilmington, N. C., and Charleston, S. C.

Atlantic Terminal.—The company has been incorporated in New Jersey recently to build a road from a point on Oyster Island in New York Bay to Walker avenue, Jersey City, where a connection with the West Side Connecting road will be made. The line will be three miles long. The capital stock is $1,500,000.

Baltimore & Cumberland.—The report of Engineer Coryell, who recently made a preliminary survey east of Hagerstown, Md., through Middletown Valley, is said to have recommended the following route: After leaving Hagerstown and Boonsboro, crossing the South Mountain via either Crampton's or Turner's Gap to Middletown, crossing to Catoctin Mountain at Lighter's Gap and to Frederick. From that town to Baltimore the proposed route touches Uniontown, Taylorsville, Harrisonville, Randallstown and Wetheredville. Working surveys have only been made to Hagerstown, the line beyond that point being only a reconnoissance, elevations being taken at certain points.

A bill has been introduced in the Maryland legislature to amend the charter of the company increasing its capital stock to $10,000,000; allowing it to merge its capital stock and road with that of other companies, or to buy or lease other lines.

Baltimore & Ohio.—An arrangement has been made by the company to operate a new short line to be built by Messrs. Knott & Ahl, who own and operate ore mines and limestone quarries about 10 miles from the main line at Shepherdstown, W. Va. Messrs. Knott & Ahl will do the grading and the company will lay the rails and operate the road.

A third track will be built between Martinsburg, W. Va., and Brunswick, Md.

The District of Columbia Commissioners have under consideration the bill to allow the company to enter the city of Washington on Delaware avenue, at the north line of the city, and proceed with four tracks at grade by means of an open cut to a point near the intersection of Delaware avenue and D street north, and there to cross several streets. It also provides that part of North Capital and other streets be closed.

Bayfield Harbor & Great Western.—The engineers have located about 18 miles of the line from Bayfield Harbor on Lake Superior, southwest toward the Northern Pacific line running between Ashland and Duluth. Preliminary surveys have been run to the connection with the Northern Pacific at Iron River Station, Wis. The line may ultimately be extended to the head of Lake Superior, and will be about 40 miles long. The locating surveys on the balance of the line will be resumed in the spring, and it is expected that the construction of the line will begin in April, when the contracts will be let. The grades are 42 ft. to the mile, and the maximum curves three degrees. The work is moderately heavy, and will probably average about 15,000 cubic yards of earth work per mile, mostly side work on a hill. The only important bridge is one 600 ft. long and 80 ft. high. W. F. Dalrymple, of Bayfield, Wis., is President, and E. C. Hollidge is Chief Engineer.

Birmingham & Jones Valley.—The surveys for this line have been completed to Gadsden, Ala., and the company is now arranging to secure funds to begin work on the line in the spring. The line will extend from Birmingham northwest through Avondale, Woodlawn, East Lake, Springville and Ashville to Gadsden, running about half a dozen miles south of the Alabama Great Southern and parallel to it for most of the distance. The new line will be about 40 miles long, and the contract for building the first section will be let shortly. The grades are 52 ft. to the mile and the curves less than one degree. C. M. Boulden, of Pensacola, Fla., is President.

California & Nevada.—Vice-President A. A. Grant is now in the East and is reported to be arranging for the extension of the road, northeasterly through California to the Nevada state line, near Bodie. The Pacific Construction & Improvement Co. is doing the construction. An officer states that 700 men will be at work on the line in three months in Contra Costa County. The first work is to complete the line to Walnut Creek, Cal. When the rains suspended construction the rails had been laid to Bryant, and the grade built nearly 20 miles beyond.

Canadian Pacific.—This company will build as early as possible in the spring a branch from Revelstoke B. C. south to the upper end of the Upper Arrow Lake, from which point there will be uninterrupted communication by steamer all the year round to Robson, at the southern end of the lake, and thus to Nelson and all Koobenany Lake points by the road built last year. This branch is to be extended later through the pass along Slocan Lake and down the river to a junction with the present road from Robson to Nelson.

Canadian Roads.—The usual amount of railroad legislation will probably come up before the Dominion Parliament, which convenes next week. The Manitoba & Northwestern, the Q'Appelle, Long Lake & Saskatchewan and the Montreal Island companies have made application for extension of time for the completion of those roads. The Ottawa, Morrisburg & New York has also given similar notice for an extension of time to build its line between Ottawa and Morrisburg, Ont., 52 miles, and to extend the subsidy of $3,200 per mile which was granted the company in the original charter.

Chesapeake & Ohio.—The report that surveys were being made from Charleston, W. Va., up Elk River, which was published last week, was incorrect so far as it connected that line with the Chesapeake & Ohio. The engineers making the survey are probably working for the owners of the mines which would be connected with Charleston by the new road.

Chicago, Lake Geneva & Northwestern.—The articles of incorporation were filed in Illinois this week. The company will construct a road from Chicago to a point on the boundary line between Illinois and Wisconsin, through the counties of Cook, Lake and McHenry. The capital stock is placed at $2,000,000.

Chicago Lake Street Elevated.—Michael C. Donald, of Chicago, Treasurer of the construction company which is building the road, reports the sale to a New York syndicate of $3,000,000 of the company's bonds, carrying the control of the road. The names of those to whom the bonds have been sold he declines to make public at present. The sale of the bonds insures that the road will be pushed to completion as rapidly as possible. It will be seven and a half miles long, and will extend from Michigan avenue to Fifty-second street. About one and an eighth miles from the business portion of the city westward has already been built. The contract for the iron work will be let, it is expected, in a few weeks.

Chicago, Rock Island & Pacific.—It has been generally known that this company had begun work on an extension through the Indian Territory from Minco, the present terminus, but knowledge of the length of line to be built has been very indefinite. The following statement from an officer of the company is therefore of special interest. The line has been located and is under contract from Minco, just south of South Canadian River, through the Indian Territory to the Red River, about 100 miles. It is intended to build this season south of the river to connections with the Missouri, Kansas & Texas and also the Denver, Texas & Fort Worth road, but the points of connection are not yet decided upon and surveys are now being made. No track has yet been laid, but the intention is to complete the line to the connections as above during the season.

Denver, Apex & Western.—A trust deed for $2,200,000 was filed at Denver by N. A. Baker, of New York, a director of the company. The deed was given to secure bonds for the construction of the road from Denver to Georgetown, Colo.

Duluth, Pierre & Black Hills.—An officer of the company writes that the contracts for completing the grading between Aberdeen, N. D., and Pierre, S. D., and for the tracklaying on the entire road will be let early in the coming spring and the work will begin as soon as the arrangements which are now pending for securing the funds for the work can be completed. Construction work has been suspended during the winter and no men are now at work on the line. About 70 miles of the grading between Aberdeen and Pierre is already completed, leaving a considerable gap to be built this year. The road is not likely to be completed early in the fall, as previously reported, but the officers expect to have the entire line in operation by Jan. 1, 1893. It is projected to extend from Oakes, N. D., southwest, through Aberdeen, Faulkton, Blunt and Pierre, S. D., a distance of about 182 miles. No work has been done between Oakes and Aberdeen beyond making preliminary surveys, and as the line between these towns parallels the Chicago & Northwestern, the construction of this section may not be undertaken at present. The maximum gradient will be 52.8 ft. to the mile and the maximum curves six degrees.

Eastern Central.—The engineers are to begin the survey for the eastern portion of this line as soon as the weather becomes more favorable. The surveys will probably begin at Galion and will extend through Belleville to Millersburg, O., 60 miles. They may be continued from that point to Bowerstown, O., passing through Canal Dover and New Philadelphia. E. B. Shifley, of Bucyrus, O., is Chief Engineer.

Galveston & Western.—An extension, two or three miles long, west of the present terminus at Latitte, Tex., is to be commenced shortly, and the material for the track has already been delivered. The line is narrow gauge, extending west of Galveston for about 13 miles, but is to be changed to standard gauge in the spring. The road was built in 1889, and the rails now in the track weigh 56 lbs. to the yard.

Great Northern.—A branch will be built from the Pacific extension south to Spokane Falls, Wash. President Hill, in an address at a meeting of the citizens of that city, promised to make it a division headquarters, also to build repair shops. The track from a point north of Spokane to the Columbia River will be laid by July probably. What is known as the Crab Creek route has been definitely chosen across the Big Bend plateau between Spokane and Columbia as offering the easiest grades and cheapest construction.

Great Northwest Central.—The hearing before the Privy Council at Ottawa on the location of the extension beyond the present terminus at Chater, Man., has been deferred, to give the company time to make a survey for a more southerly line. The officers of the Manitoba & Northwestern protested against the location proposed by the company, claiming that the extension was for a large part of its length within 15 miles of the main line of the Manitoba & Northwestern, and for some distance within eight miles, through a country that can hardly support one road.

Hinton & New River.—T. C. Hackett has been engaged to make the necessary surveys and to prepare the data for letting the contracts. He is forming his surveying party, and will soon be ready to begin the work. The survey will be made from Hinton along New River to the Norfolk & Western in Mercer County.

Illinois & Iowa.—Articles of incorporation of the Illinois & Iowa Railway & Terminal Co., capital stock $1,500,000, have been filed at Davenport, Ia. The plan involves the construction of a double-track bridge across the Mississippi and transfer and storage yards on both sides of the river (Davenport, Ia., and Moline, Ill.), also an independent road to Clinton, Ia., 34 miles north of Davenport, giving the Chicago & Northwestern a line into that city from Clinton.

Joliet, De Kalb & Northern.—Articles of incorporation of the company were filed in Illinois last week with the Secretary of State. The company proposes to construct a railroad from Joliet to De Kalb, passing through Kendall and Kane counties and part of Will and De Kalb counties. The line will be about 45 miles long, as stated last week. The capital stock is $1,000,000.

Kings County Elevated.—A short note about the extension to Montauk avenue was printed last week. Further details of the structure will be interesting. The present extension is 3,320 ft. long and was begun last October, to fulfill the requirements of the company's charter, which called for the first section (1.3 miles) from the old Brooklyn city line at Sackman street to Schenck

avenue to be completed in one year, the second section from Schenck avenue to Logan street (3,320 ft.) in three years, and the balance (about a mile) from Logan street to the new city line in five years; so the company is building only what its charter calls for, as that section of the city is thinly populated. The Phœnix Bridge Co., of Phœnixville, Pa., is building the road, including roadbed and stations, ready for operation, not sub-letting, but doing all the work, iron and wood, with its own men. The superstructure is placed on brick piers with a base 8 ft. square. Phœnix six segment columns, and lattice transverse and longitudinal girders, of about 50 ft. span, four girder system, comprise the iron work. The chord members of the girders are made of mild steel webs, and other angles of iron; columns of steel. The columns of the structure, except at stations, are 14 ft. apart in the street. Transverse girders have been placed from curb to curb for a station at Jerome avenue, the buildings to be put up in the future when the traffic will warrant it. The first station for operation is at Linwood street, and the second and last at Montauk avenue, all on the Eastern Parkway. The line will be opened to the Linwood Street Station for traffic Feb. 22, and to Montauk Avenue Station about April 1. The company has two years to complete the balance of the structure to the line between Kings and Queens counties; the route being along the Parkway to Market street, through Market street (two blocks) to Liberty avenue, along Liberty avenue to the end, at or near Enfield street.

Lake Erie, Alliance & Southern.—The engineers of this company are making surveys for an extension from Bergholz, Jefferson County, O., southwest about 15 miles to Jewett, O., by way of Amsterdam and Germano. At Jewett the line will make a connection with the Wheeling & Lake Erie, with which company an arrangement has been made to run over its tracks to Wheeling, W. Va.

Lehigh Valley.—The construction operations in Bayonne, N. J., have been suspended temporarily by the company. The bridge from the shore to Newark Bay channel is built and piers for a draw are being put in.

Little Rock, Sheridan & Saline River.—Articles of incorporation have been filed in Arkansas. The capital stock of the company is $125,000. The road will be 23 miles in length and will extend from Wrightsville County, in a southwesterly direction through Saline to Sheridan, Grant County.

Maryland & Washington.—The Commissioners of the District of Columbia held a hearing last week to consider the bill to give the right of way to the company. The route is to connect a railroad coming in from Maryland at a point on the District boundary near the Queen's Chapel road, and thence through Brookland village and into the city by way of Rhode Island avenue extended in Washington. A. P. Fardon, V. H. Manning and J. O. Johnson are interested in the project.

Missouri, Kansas & Eastern.—The charter of the company was filed in Missouri last week. This company has a capital stock of $4,500,000, and is formed for the purpose of constructing a standard gauge road from the town of Franklin, in Howard County, eastwardly through the counties of Howard, Boone, Calloway, Montgomery, Warren, St. Charles, and St. Louis to the city of St. Louis, 180 miles. Franklin is a village opposite Booneville, and the proposed road is projected, it is reported, as a St Louis connection for the Missouri, Kansas and Texas. The line of the Cleveland, St. Louis & Kansas City, which is in operation from St. Charles to Hamburg, 17 miles, and which is graded several miles beyond, may be acquired by the new road.

Missouri Pacific.—It is reported that the company has decided to resume work on what is known as the River Route extension to Jefferson City, Mo. The new line will be an extension of the Jefferson, Boonville & Lexington road, and will begin at Boonville and extend along the south bank of the Missouri River to Jefferson City. The length of the line will be about 45 miles and its construction will complete a continuous route along the Missouri River between Kansas City and St. Louis. The company began the construction of this line in 1890, but on account of the excessive demands for right of way, work was soon suspended.

New Roads.—Frederick Weyerhauser and other lumbermen of Northern Wisconsin are reported to be interested in a company now being organized to build a railroad from Chippewa Falls north to a connection with the Minneapolis, St. Paul & Sault Ste. Marie road, near Weyerhauser, about 40 miles. It is proposed to begin the construction of the line in the spring and the work may be continued north to Hayward, about 80 miles from Chippewa Falls, and perhaps also to Superior, Wis.

An effort is being made by citizens of Selinsgrove and Mifflinburg, Pa., to organize a company for the construction of a road to extend from Selinsgrove to Mifflinburg. The proposed route is 15 miles long, and would pass through Schoch's Mills, Beaver's Mines, Kratzerville, Beufer's Mills, New Berlin and Mifflinburg.

New York Bay Extension.—The contracts for building part of this new extension of the Long Island are to be let by March 1. The road is to be built as a cut-off from the northern part of Long Island to Brooklyn and Rockaway. The branch has been located from Garden City on the Oyster Bay division southwest to Valley Stream, about five miles. This will give a line diagonally across the island to Rockaway. No surveys have yet been made for the balance of the line easterly to the connection with the Manhattan Beach branch south of Brooklyn. The first few miles are to be let at once and grading will probably begin as soon as the contract is awarded. The maximum grade will not be greater than 26½ ft. to the mile, the maximum curvature being three degrees. Two iron bridges will be built, one of 30 ft. and one of 40 ft. span.

Norfolk & Western.—President Kimball, of this line, in an interview last week said his company was using all possible haste to complete the Ohio River extension of the line, and that unless there was some unexpected difficulty that part of the line would be finished and through trains running in August. The second tunnel on the line has been recently opened through and the grading and tracklaying is going along as fast as the weather and surrounding conditions will permit. There is about 50 miles of the line yet to be built.

The Commissioners of the District of Columbia have reported favorably upon the act authorizing a change in the route of the extension into Georgetown, D. C., to allow the proposed branch to cross the canal and make a more convenient route than that laid out originally.

The Commissioners of the District of Columbia held a hearing this week on the bill to authorize the company to extend its line into the District of Columbia. This company has had for some time a Virginia charter which authorizes the laying of its tracks to the Potomac River, opposite Washington. The present bill authorizes the company to extend its road after it has crossed the river above Georgetown to Rock Creek and to the terminus, west of Twenty-sixth street and between Pennsylvania avenue and Virginia avenue. The location is not to obstruct the K street bridge over Rock Creek, nor of any part of that street.

Ohio River.—This company is pushing the work on its independent line to Huntington, W. Va. The grading is completed almost to the Guyandotte River, and the iron work for the bridge over that stream will soon be erected. The work done is of the most substantial sort.

Otis Elevating.—About 400 men are now employed in building the railroad over the mountain ledges on the face of the Catskill Mountains from Palenville, N. Y., to a point just below the old Catskill Mountain House.

Ottawa & Gatineau Valley.—This road was opened for traffic on Monday from Hull, opposite Ottawa, to Wakefield, Que., a distance of 20 miles. The third 10-mile section will be opened for traffic some time next fall. Eventually the line will be run up to Lake Desert, 70 miles up the Gatineau River.

Pan-American.—The grading so far completed on this road south of Victoria, Tex., only amounts to a few miles, but it is promised that a large force will soon be put on the work, arrangements to that end being now under way. There has been a failure to locate the line for any long distance, and this has caused a delay. About 25 miles of the route has been located, but the surveys are to be resumed at once and continued through Refugio to Matamoras on the Rio Grande River.

Pennsylvania.—Local newspapers are printing reports that the extension of the Sunbury division to Scranton, Pa., has been decided upon and that the construction will begin in a few days, the surveys for the line having been made some time ago. It is said that surveys were made on both sides of the Susquehanna River, and that it has been decided to cross the river near Wilkesbarre and build a new line 15 miles long on the north side parallel to the track of the Delaware, Lackawanna & Western to Pittston, and thence to Scranton. The action in beginning work at the present time is of course attributed to the recent leases of the Lehigh Valley and Central of New Jersey by the Reading.

The short line from Pottsville to Shenandoah, Pa., which was abandoned on Dec. 11 on account of the road caving at Wiggans, resumed traffic Feb. 11. A new branch, 1,600 ft. long, has been built around the breach and connected with the main road.

Pittsburgh, Chartiers & Youghiogheny.—A third rail is being laid on the narrow gauge coal road connecting with this line at Hays Station, so that standard gauge cars can be run over it. The line extends from Hays, about six miles from Pittsburgh, along Six Mile Run to the Peters Creek Valley, some six or eight miles, reaching valuable coal tracts. Another branch from Esen to Elizabeth, Pa., on the Monongahela River, intersecting the Streets Run branch, will be built this year.

Queenstown & Niagara.—When the Canadian Parliament meets next week an act of incorporation will be sought for the Queenstown & Niagara Railway & Bridge Co. to construct a bridge or bridges for railroad and other purposes across the Niagara River, near the town of Queenstown, and to build a railroad between Niagara Falls, Queenstown and the City of St. Catharines, Ont. The company wants to charge a toll of 20 cents for each foot passenger and 50 cents for single carriages.

Roanoke, Fincastle & Southern.—Work has been resumed on the Fincastle and Cloverdale section in Virginia, which had been suspended during January on account of the rough weather. This road is to be completed by May 1, 1892.

Southern Pacific.—A force of 900 men is working on the new road along the Gila River east of Yuma, Ariz., building the last 20 miles, 17 miles of the new work having been completed and put in operation. Nine miles additional will be ready for operation this week. The elevation of the new location varies from 18 to 70 ft. above the high water mark of last year's flood and is thought is effectually guarded against the ravages of the Gila River during the spring freshets. In Southern California the company is building two new lines, one of which is a new branch from the main line near Colton through Redlands to Crofton, Cal., a distance of seven miles. The grading is done and tracklaying is now being rapidly pushed. A three-mile branch from Santa Maria up the Pacific Coast to a proposed wharf is the other project. The track on it will shortly be laid. The company expects to make a very large wharf.

Tamaqua, Hazelton & Northern.—All construction work has been ordered suspended on the new line from Lofty, Pa., on the Catawissa division, to connect with Coxe Bros.' new road, the Drifton, Susquehanna & Schuylkill. This road has been completed as far as to allow of its use for coal purposes and the work of erecting passenger and freight depots and ballasting for passenger traffic was being pushed as rapidly as possible.

Texas Trunk.—The Receiver has been authorized to connect the road with the Houston & Texas Central in Dallas, Tex., and has been authorized to negotiate a loan of $12,000 to be expended in the work.

Virginia Roads.—The House has passed the following bills: To incorporate the Richmond, Chesterfield & Petersburg Railroad; to incorporate the Richmond, Rappahannock & Valley Railroad, and to incorporate the Nottoway, Keysville & Western Railroad authorized to construct a road from Nottoway Court House or Blackstone to Keysville or Charlottesville.

Washington & Western.—The Baltimore & Ohio now has a force of 200 men at work on the Washington & Western extension. Four pile driving machines are at work along the Potomac River preparing the roadbed.

West Virginia, Central & Pittsburgh.—William Walmsdorf, a large timber operator on Roaring Creek, W. Va., has contracted with this company to build a branch line from the mouth of Roaring Creek to his timber holdings, 29 miles up the valley. Mr. Walmsdorf will build the roadbed, bridges, etc., and the railroad will complete the line and operate it.

Williams Valley.—The road west of Brookside is now being graded toward Williamstown, Pa., the western terminus of the Summit branch of the Pennsylvania. The construction of the line to Williamstown will connect the Tremont branch of the Philadelphia & Reading and the Summit branch line, there being at present a gap of a few miles between the termini of the branches. The contract has been let to John Jameson, of Bloomsburg, Pa., for grading the extension of the line west through Williamstown to Lykens on the Summit branch road, about 10 miles west of Williamstown. The road will be 12 miles long when completed. Three miles of track has been laid this year. The line runs near the Peters Mountains, in the southern part of Schuylkill County, and has a maximum grade of three per cent. and maximum curves of 20 degrees. There is only one iron bridge, a 60-ft. structure with two spans. C. R. Williams, 608 Chestnut street, Philadelphia, is President, and C. M. Kaufman, of Tower City, Pa., is Secretary.

Yakima & Pacific Coast.—Griggs & Huestis, of Tacoma, Wash, the contractors for this branch of the Northern Pacific extending west from Chehalis, Wash., on the main line to the Pacific coast, have about 500 men engaged on the grading and tracklaying, and are soon to increase the number. The line between Chehalis and South Bend, the western terminus, will be 56 miles long and the track was laid in 1891 on 19 miles to Pe Ell. Tracklaying has been recently resumed west of that point, and the engineers expect that the line will be ready for operation by July next. Less than half the grading remains to be done, and this work will probably be completed without being interrupted. There has been a good deal of heavy work on the completed portion, the grades at some places being 95 ft. to the mile. The maximum curves are 12 degrees. An 80 ft. drawbridge is being built over the South Fork of the Willapa River on the western end of the line.

GENERAL RAILROAD NEWS.

Allegheny Valley.—In pursuance of the terms of the sale of the road to the purchasing committee, the United States Court at Pittsburgh has made an order authorizing W. H. Barnes, Receiver of the company, to transfer all the property belonging to the Allegheny Valley Railroad Company to the new corporation, the Allegheny Valley Railway Company.

Atlanta & Florida.—T. W. Garrett has been appointed Receiver by the State Superior Court at Atlanta, Ga., and is now in possession of the road. The appointment was made in the suit brought by local creditors for an indebtedness of $100,000. Mr. Garrett was appointed Receiver, Feb. 9, and on the same day R. H. Plant was appointed Receiver by the United States Court at Macon in the suit brought by the East Tennessee, Virginia & Georgia. The question of the jurisdiction of the receivers will come up at a hearing at Macon next week, but it is thought that the order appointing Mr. Plant Receiver will be revoked and that Mr. Garrett will be confirmed as Receiver by the United States Court. The plan proposing that the stockholders subscribe for enough new stock to extinguish the floating debt, which has caused the embarrassment of the road, was not successful.

Baltimore & Ohio.—The following statement shows the earnings and expenses of the entire system for January, 1892, and for the four months ending Jan. 31, 1892, with comparisons. On the lines east of the Ohio River, the earnings for January were $1,522,816, an increase of $76,831; expenses, $1,108,705; increase, $64,839; net increase, $11,992. On the lines west of the Ohio River the earnings were $528,112; increase, $70,644; expenses, $429,803; increase, $22,891; net increase, $47,753. The summary of the entire system east and west of the Ohio River gives earnings of $2,050,928; increase, $147,475; expenses, $1,538,508; increase, $87,730; net increase, $59,745. The earnings for the four months of the fiscal year 1892, compared with the same months of 1891, show: East of the Ohio River a decrease in net earnings of $88,036. On the lines west of the Ohio net earnings increased $131,953. The summary of the entire system east and west of the Ohio River gives the earnings at $8,700,778; increase, $546,970; operating expenses, $6,297,010; increase, $503,053; net increase, $43,917.

Baltimore & Ohio Southwestern.—The annual report shows gross earnings for the year of $2,500,594; increase, $171,149. Operating expenses, $1,555,663; increase, $45,620. Net earnings, $944,931; increase, $125 530. Other income, $3,533; increase, $1,288. After the payment of fixed charges, taxes, etc., there was a balance of $379,144; increase, $156,802. The directors ordered a payment of five per cent. interest on the first income bonds against four per cent. last year, and one per cent. on the second income bonds, payable March 15

Central New England & Western.—The appointment of J. O. K. Sherwood as Receiver for the Poughkeepsie Bridge and auxiliary roads was in a suit brought by the Bondholders' Committee some time ago, which was kept in abeyance by the Mercantile Trust Co. of New York, the trustee of the mortgage. The Philadelphia & Reading, the new owner of the Poughkeepsie Bridge, intervened in the suit, which is an amicable one. It is brought up at this time to facilitate the transfer of the railroad and the Poughkeepsie Bridge to the Reading.

Charleston, Cincinnati & Chicago.—The decision by the Superior Court of Tennessee for the sale of the road noted last week, will tend to completely disarrange the plans of the bondholders who have been trying to reorganize the railroad. In the litigation that followed the bankruptcy of the company several receivers were appointed in South Carolina by the Federal Court, and in Kentucky another receiver was appointed. In Tennessee a receiver for the road was named by the State Court. As a result, the Superior Court of that state has ordered that all roads built by this company in Tennessee and all franchises belonging to it must be sold. It is likely an appeal will be taken from this decision. The decision was in the suit brought by the contractors, and is in their favor.

Chattanooga Southern.—H. S. Chamberlain, recently elected President, was appointed Receiver by the United States Court at Chattanooga on Feb. 5. The road was recently purchased by the East Tennessee, Virginia & Georgia, and the appointment of the receiver is made in the suit brought by that company and in its interest.

Chicago & Northwestern.—A special statement has been issued giving the results of the operation of 4,273 miles of road last year as against 4,258 miles in 1890. The traffic returns show the following comparisons: Gross earnings, $29,395,791, an increase of $1,225,765; operating expenses, $19,122,635, an increase of $652,432, and net earnings, $10,272,156, an increase of $573,333.

The charges, including sinking fund, amounted to $9,139,023, and dividends, $3,445,804, leaving a surplus for the year of $688,329, an increase over 1890 of $71,432.

This does not include the earnings of the Omaha or the Trans-Missouri lines, nor the income from land sales, but only the Northwestern system proper.

Cincinnati, Jackson & Mackinaw.—The separate sales of the various divisions of the road made in the fall and winter to the reorganization committee were formally confirmed by the United States Circuit Court at Toledo, Feb. 12. The various details of the reorganization plan have not yet been published, but it is thought that the plan will be announced this month. The name said to have been decided upon for the new company is the Cincinnati & Central Michigan.

Connecticut River.—Application has been made by the company to the Massachusetts Legislature for permission to increase its capital stock from $2,670,000 to $5,000,000 in order to enable it to double track the entire road, to lay two additional tracks from Springfield to Holyoke, to improve its terminal facilities at Springfield, Mass., and at other stations, and to eliminate grade crossings.

Corning, Cowanesque & Antrim.—The company has made application to the State Railroad Commissioners of New York for permission to increase its capital stock from $2,000,000 to $5,000,000. The road is one of the leased lines of the Fall Brook Coal Co., and is about 53 miles long.

Denver & Rio Grande.—The company reports for the six months ending Dec. 31 gross earnings of $4,618,419, a decrease of $366,513 as compared with the corresponding period of last year, and net earnings, $2,001,202, a decrease of $142,253. Fixed charges were $1,428,503, leaving a surplus of $572,699, which was applied to reducing the company's liabilities. The earnings on the preferred stock so diverted were equal to 2.45 per cent.

Great Northern.—The earnings for the month of January were as follows:

	1892.	1891.	Inc. or Dec.	
St. P. M. & M. leased lines	$798,944	$654,862	I.	$144,082
Eastern of Minn	62,082	40.643	I.	21,439
Mont. Central	97,075	98,198	D.	1,123
Total	$958,101	$793,703	I.	$164,398

Gross earnings for seven months ending Jan. 31, were.

St. P., M. & M. leased lines	$8,201,346	$6,909,969	I.	$1,300,377
Eastern of Minn	826,264	454,435	I.	371,829
Mont. Central	757,370	753,351	I.	4,019
Total	$9,784,982	$8,108,756	I.	$1,676,226

Hudson Suspension Bridge & New England.—In the suit brought against the bridge company and the railroad company by the Atlantic Trust Co., Henry Martin, of Martin, Lawrie & Co, of New York City, has been appointed Receiver. The suit is brought to protect the interests of bondholders.

Illinois Central.—The income from traffic for the six months ending Dec. 31, 1891, is shown in the following table:

	1891.	1890.	Inc.
Miles operated	2.884	2.875	9
Gross receipts from traffic	$10,175,613	$9,320,262	$855,351
Operation expen. and taxes	7,068,971	6,270,341	798,630
Net earnings	$3,106,642	$3,049,921	$56,721

The gross receipts from traffic for the month of January, 1892, are estimated at $1,502,589, an estimated decrease of $13,353 from the earnings for January, 1892.

New York, New Haven & Hartford.—The report of the railroad for the quarter ended Dec. 31, and six months, shows:

	1891.	1890.	Inc. or dec.	
Gross earnings	$2,957,955	$2,886,724	I.	$71,231
Oper. expenses	2,193,755	2,219,309	D.	25,554
Net earn	$764,200	$667,415	I.	$96,785
Other income	47,959	49,532	D.	1,573
Total net	$812,159	$716,947	I.	$95,212
Fixed charges	421,462	452,988	D.	31,526
Balance	$390,697	$263,959	I.	$126,738
Cash	210,398	.....		.....
Profit and loss surplus	3,890,484	.....		.....
Six months, since July 1:				
Gross earnings	$6,188,219	$5,918,187	I.	$270,032
Oper. expenses	4,002,517	3,955,411	I.	47,106
Net earnings	$2,185,702	$1,962,776	I.	$222,926
Other income	90,233	111,823	D.	12,590
Total net	$2,284,935	$2,074,599	I.	$210,336
Fixed charges	863,806	861,503	I.	2,363
Balance	$1,421,069	$1,213,096	I.	$207,973

Northern Pacific.—The operations of the Northern Pacific and Wisconsin Central roads for December and six months are given below:

December.	1891.	1890.	Inc. or dec.	
Gross earnings	$2,461,070	$2,711,286	D.	$250,216
Oper. expenses	1,389,502	1,496,543	D.	107,041
Net	$1,071,568	$1,214,743	D.	$143,175
Other income	205,324	51,928	I.	153,396
Total net	$1,276,892	$1,266,671	I.	$10,221
Fixed charges	1,089,417	1,064,917	D.	24,500
Surplus	$187,475	$201,754	D.	$14,279
Preferred stock	36,626,421	36,909,853	D.	283,432
July 1 to Dec. 31.				
Gross earnings	$17,153,104	$17,466,674	D.	$313,570
Oper. expenses	9,625,773	9,832,096	D.	206,323
Net	$7,527,331	$7,634,578	D.	$107,247

Philadelphia & Reading.—The Boards of Directors of this road, Port Reading, the Lehigh Valley and the Central New Jersey Railroad have ratified the various leases and agreements, which are already in effect. The Lehigh Valley lease dates from Dec. 1, 1891, and the New Jersey Central lease from Jan. 1, 1892.

Philadelphia & Sea Shore.—The foreclosure sale by order of the Chancery Court of New Jersey is announced for Feb. 23 at Camden, N. J. The road to be sold extends from Winslow Junction to Sea Isle, N. J., 40 miles. Track has been laid for this distance, but regular trains have not yet been run, as the road is not ballasted. The Receiver estimates that it will take $15,000 to prepare the road for regular operation. Special trains have been occasionally run to within nine miles of Sea Isle City. The Tuckahoe & Cape May City line, which is practically a branch of the road, may also be sold in February. The company has a claim of $80,000 against the branch, and R. P. Wilson, of Vineland, N. J., has been appointed Receiver. The claims of the local creditors against both roads amount to nearly $70,000, and there is a dispute as to the legality of $465,000 worth of bonds issued while E. R. Wood, of Philadelphia, was the contractor for the construction of the line.

Southern Pacific.—The statement of earnings for 1891 gives the gross earnings as $50,440,000; operating expenses, $31,164,000; net earnings, $19,280,000, or $2,080,000 more than in the previous year.

Terminal Railroad Association of St. Louis.—Drexel, Morgan & Co., of New York, offer for subscription at 96½ and accrued interest $7,000,000 fifty-year first mortgage 4½ per cent. bonds of this company, which furnishes terminal facilities in St. Louis for the traffic of the six important roads. The bonds now offered are issued to pay for the various properties acquired and to defray the cost of the extensive improvements, including the new union depot.

Toledo & South Haven.—In the United States court at Grand Rapids, Mich., a decree of foreclosure has been entered in the case of the Farmers' Loan & Trust Co., of New York, against the railroad. The Trust company has a mortgage of $218,000 on the property and brought suit to recover. The road extends from South Haven to Lawton, Mich., 37 miles.

Wabash.—The company reports gross earnings for December of $1,348,196, an increase of $223,005 as compared with the same month of the previous year, and net earnings $379,000, an increase of $97,852. For the six months ending Dec. 31 the gross earnings were $7,907,270, an increase of $922,895 as compared with the corresponding period of the previous year, and net earnings $2,200,969, an increase of $182,722.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, Feb. 16, 1892.

The freight committee of the Central Traffic Association at its February meeting decided to refer to arbitration the question of the establishment of permanent differentials on lake and rail traffic; the arbitrators to be three disinterested parties to be selected, one each by the lines in the Central Traffic Association, the trunk lines and the lake lines. C. S. Wright, of the Baltimore & Ohio, was elected Vice-Chairman of the Freight Committee; A. S. White Chairman of Committee on Relations with Trunk Lines, and W. D. Holliday Chairman of Committee on Relations with the Southwestern Railway and Steamship Association.

The interested lines have not yet announced what action they propose to take in reference to the relief granted against the action of the Southern Pacific in the matter of commissions on trans-continental immigrant traffic, but it is safe to say that none of them will lose any of the business if they can get it in any way. The Atchison, Topeka & Santa Fe has already requested Chairman Vining, of the Trans-Continental Association to submit a proposion to members to make the rate from Missouri River points to the Pacific Coast, second class, $14.30. The present rate is $35, and the difference, $20.70, is the commission authorized under the two rulings referred to above.

The general freight agents of the east-bound lines have unanimously agreed not to hereafter issue return passes to men accompanying shipments of horses. The subject of switching and cartage charges was again considered last week, but no agreement was reached. The Chicago & Grand Trunk declined to change its position, and consequently the matter was referred back to the general managers.

The Western Freight Association at its February meeting agreed to charge full rates on material used in the construction of the World's Fair buildings.

A decision in line with that in the Counselman case was rendered by Judge Allen, of the U. S. Circuit Court at Springfield, Ill., Feb. 11. The case was one brought against the Wabash & Grand Trunk and J. B. M. Keblor, in which one Ellis is charged with having received and the Wabash and Grand Trunk with having granted rebates on flour shipped by Kehlor Bros. from Litchfield and St. Louis to Montreal. Richard Dowle, agent of the Great Eastern line, was under examination before the grand jury, and had been arraigned for contempt of court in refusing to answer questions relative to his personal connection with the case. Judge Allen held that he could not be compelled to produce letters, telegrams and private memoranda, on the ground that the law would not oblige him to criminate himself.

Chicago grain dealers now complain of diversion of grain shipments, not only to the St. Louis and other Southern routes, but to the North as well. They claim that the "Soo" line and Canadian Pacific have shaded the rates sufficiently east of St. Paul to draw considerable quantities of grain from Nebraska and Iowa that way over the Chicago, St. Paul, Minneapolis & Omaha. The reports that the Trunk Lines between New York and Chicago are secretly cutting the rates on westbound merchandise are also increasing in frequency. It is said that a good deal of the higher class freight is carried at 33 per cent. less than tariff rates.

Traffic Notes.

The gains made by the Toledo Inspection and Weighing Bureau during the month of January aggregated $9,411, of which about four-fifths was made by weighing carload lots.

The Railroad Commissioners of Georgia, having notified the Richmond & Danville that they would shortly proceed in the courts against that company to enforce the statutory penalty for non-compliance with the commissioners' order of Sept. 4, requiring freight passing over two or more roads to be billed at 10 per cent. less than local rates, the road has filed a bill in the United States Circuit Court asking an injunction restraining the Commissioners from taking any action.

The Richmond & Danville has just issued a circular to conductors requiring compliance with the law of Georgia which prohibits the mixing of white and black people in cars. The newspaper accounts indicate that this law, which was passed several months ago, has been ignored, both by railroads and the public, until now, most people having apparently no idea that such a law was in existence. This law also requires conductors of street cars to separate the races as much as practicable.

Manager J. S. Leeds, of the California Traffic Association, has issued a circular to members urging them to carefully designate the whole route for every shipment of freight that they make, and to see that goods bought in the East are routed by shippers with equal care. It appears that the bills of lading of the Southern Pacific have a printed clause which stipulates that through rates can be guaranteed only on condition that the company select the route beyond its own lines. Mr. Leeds' circular seems to be intended to get rid of that rule.

The Kansas lines held a conference with the Railroad Commissioners of that state last week in regard to the reductions on 4th and 5th class freight ordered by the board. A compromise was arrived at by which the proposed order is to be restricted in its application both as to commodities and territory affected, and it will now be put in force by the roads. In regard to a rate on sugar from Pacific coast points to Kansas, it was agreed to make a blanket rate of $1 for 100 lbs. for the state of Kansas, without violating the long and short haul provisions of the Interstate Commerce law. This will probably have the effect of shutting out California sugar from Hutchinson and vicinity and points east of there, as the regular rates from the Atlantic seaboard will be lower.

The corrected statement of tonnage passing the lower Missouri River crossings (Kansas City, Leavenworth, Atchison and St. Joseph), for the month of October, 1891, has just been issued, and is as follows for all tonnage passing in both directions:

Line.	Tonnage.	Per cent. Revenue.
Atchison, T. & S. F.	22.9	23.8
Chicago & Alton	11.4	12.5
C. B. & Q.	14.6	15.7
Chi. Mil. & St. Paul	5.2	6.2
Chi. R. I. & Pac.	8.8	9.4
Chi. St. Paul & Kan. City	5.3	5.5
K. C., F. S. & Memphis	6.2	6.7
Wabash	10.6	9.5
Mo. Pacific	13.0	10.7
	100.0	100.0

Georgia Railroads Must Love Their Neighbors as Themselves.

The Railroad Commission of Georgia has issued the following rule:

"Railroads shall, without delay, switch off and deliver to any connecting road of the same gauge all cars consigned to points on or beyond such connecting roads. They shall, at the terminus or any intermediate points, without obstruction or delay, receive from a connecting road of the same gauge, when offered, all cars consigned to any point on the road to which the same is offered, or any connecting road with said road, and to which it is destined, and transport said cars to their destination with reasonable diligence. No railroad shall discriminate in its rates or tariffs of freight in favor of any line or route connected with it as against any other line or route, nor, when a part of its own line is sought to be run in connection with any other routes, shall such railroad discriminate against such connecting line in favor of the balance of its own line, but said railroad shall have the same rates for all and shall afford the usual and like customary facilities for the interchange of freight to the patrons of each and all lines alike."

It will be seen that this attempts to settle one of the knottiest questions connected with state regulation of traffic; one which has thus far baffled the Interstate Commerce Commission and Congress, and which has been characterized by sharp controversies in England.

The Interstate Commerce Commission.

George J. Kindel, a manufacturer of mattresses at Denver, has filed a petition and complaint with the Interstate Commerce Commission against the Atchison, Topeka & Santa Fe, the Chicago, Burlington & Quincy, the Chicago & Alton and five other roads, for discrimination. He states that these roads grossly discriminate against him by carrying manufactured mattresses from Chicago and Missouri River points to Colorado in cars with furniture as third class and in cars with spring beds as fourth class, while they refuse to carry mattress material at less than first class or double first class rates in less than carload lots. He asserts that he has been obliged to abandon the manufacture of mattresses at Denver and prays for $10,000 damages.

The Commission, in an opinion by Commissioner Veazey, has announced its decision of the case of Murphy, Wasey & Co. against the Wabash, the Chicago, Burlington & Quincy, the Detroit, Grand Haven & Milwaukee, the Chicago, Rock Island & Pacific and others, in favor of complainants, who ship chair stuff, bed and mattress material in mixed carloads from their factory in Detroit to their other factory in Omaha, and on chair stuff, for example, are charged as much per 100 lbs. under the Western classification for the transportation from Chicago as for the more bulky finished article. The Commission reaffirms its power and duty to fix maximum charges in cases where complaint is made of unreasonable rates. The points decided are briefly as follows:

A carrier should receive a greater compensation in the aggregate for hauling a carload of large tonnage than one of less tonnage, but, other things being equal, as a general rule, the rate per 100 lbs. should be less in the former than in the latter case. A maximum rate is prescribed for complainant's shipments in mixed carloads of chair stuff, spring bed and mattress material, all wooden, minimum weight 25,000 lbs., of not exceeding 20 cents from Chicago to Omaha, resulting in a through rate from Detroit to Omaha via Chicago of 30 cents.

The Commission has also decided the case of J. M. Rising and others against the Savannah, Florida & Western and others. The case involves rates on Florida strawberries, and it is ruled that rates on strawberries from Callahan, Fla., to New York should not exceed $3.33 per 100 lbs., or $1.66⅔ per crate of 50 lbs.

Eastbound Freight Shipments.

The shipments of eastbound freight from Chicago by all the lines for the week ending Feb. 13, amounted to 98,868 tons, against 105,259 tons during the preceding week, a decrease of 6,451 tons, and against 71,490 tons during the corresponding week of 1891, an increase of 27,318 tons. The proportions carried by each road were:

Roads.	Wk. to Feb. 13. Tons.	P. c.	Wk. to Feb. 6. Tons.	P. c.
Michigan Central	17,374	17.6	16,620	15.8
Wabash	7,578	7.7	9,398	8.9
Lake Shore & Michigan South.	13,349	13.5	15,697	14.9
Pitts., Ft. Wayne & Chicago	13,840	14.0	15,662	14.9
Pitts., Cin., Chicago & St. L	8,528	8.6	9,619	9.6
Baltimore & Ohio	8,090	8.2	8,781	8.3
Chicago & Grand Trunk	9,834	9.9	8,725	8.3
New York, Chic. & St. Louis	9,854	10.0	11,260	10.7
Chicago & Erie	10,370	10.5	10,067	9.6
Total	98,808	100.0	105,259	100.0

Of the above shipments 11,582 tons were flour, 54,387 tons grain, 3,533 tons millstuffs, 5,115 tons cured meats, 7,821 tons dressed beef, 1,777 tons hides and 3,310 tons lumber. The three Vanderbilt lines carried 41.1 per cent. of all the business, while the two Pennsylvania lines carried 22 6 per cent.

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N. Y. Central....	181	Dul., S. Sh. & At.	20	N. Y., L. E & W..	50	Illinois Central...	56	Louisv. & Nashv.	30	Royal Blue, L'td.	24
Balt. & Ohio.....	118	Richm. & Danv..	20	Cent. R. R. of N.J.	58	N. Y. & New Eng.	72	Old Colony R. R..	46	Long Island R. R.	23
Lehigh Valley....	66	Phila. & Reading.	185	E. Tenn., Va. & Ga.	31						

Various other roads, 295 cars. Total number of cars, 1,275, running on 65 different railroads.

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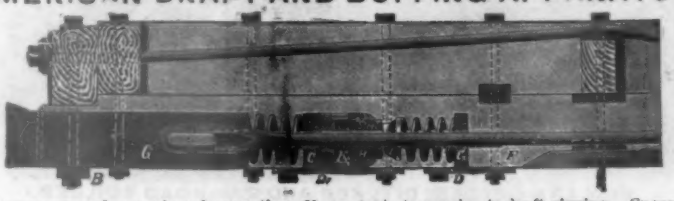

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